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REPORT OF PUBLIC HEALTH SERVICE TECHNICAL
COMMITTEE ON PLUMBING STANDARDS

Public Health Service
Washington, D. C.

September 1962

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Report of
Public Health Service
TECHNICAL COMMITTEE
on **PLUMBING STANDARDS**

September 1962

A Proposed Revision of
The National Plumbing Code
ASA A40.8-1955

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Springfield VA 22151

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Environmental Engineering and Food Protection
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Foreword

The American Standards Association's "National Plumbing Code," ASA A40.8-1955, represented the consensus of national organizations for a standard of plumbing practice suitable for State and local application. Since its issuance in 1955, it has been particularly useful to cities and municipalities as an authoritative guide in revising and up-dating their standards on plumbing installations.

The American Standards Association recognized the need for periodic revision of the Standard to keep pace and recognize research findings and material developments. The sponsorship of the revision was assigned to the National Association of Plumbing-Heating-Cooling Contractors, American Public Health Association, and the Building Officials Conference of America. At the request of the sponsors, the U.S. Public Health Service established a Public Health Service Technical Committee on Plumbing Standards to serve as a task force to revise the American Standards Association Code. This Committee was established in 1957 and through a series of meetings and by correspondence developed its report, "A Revision of the National Plumbing Code, ASA A40.8-1955," on September 15, 1962. The current membership of the Committee is contained in the Report.

There is a great need for modern plumbing codes in many areas of the country. The Prestonsburg, Kentucky, study conducted by the U.S. Public Health Service demonstrated conclusively that good health was dependent upon good plumbing. New materials, notably plastics, have appeared in the plumbing industry. Research results demonstrated that certain pipe sizing procedures should be reviewed critically.

It is gratifying to note that the Technical Committee has placed principal emphasis on the public health aspects of plumbing systems. At the same time the Committee has developed criteria which will result in the installation of durable plumbing systems which provide the maximum serviceability. It is the considered opinion of the Committee that the revisions have been made in the public interest and will facilitate the discharge of responsibility by the plumbing industry in the attainment of the goal of improved public health protection through the installation of safe, sanitary plumbing systems.

MALCOLM C. HOPE, *Chairman*,
Public Health Service
Technical Committee on Plumbing Standards

Public Health Service
Technical Committee on Plumbing Standards

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TECHNICAL ASSISTANT
Ronald F. Coene, USPHS

HYDRAULICS CONSULTANT
Robert S. Wyly
National Bureau of Standards

FEDERAL HOUSING ADMINISTRATION LIAISON
Charles B. Droba
James A. McCullough

ACKNOWLEDGMENTS

Special recognition is due for the contribution made by the National Bureau of Standards by Mr. Douglas E. Parsons, Chief, Building Research Division, in making the services of Mr. Robert S. Wyly available to the Committee. Mr. Wyly was invaluable in providing guidance and assistance on the hydraulics and pneumatic considerations involved in the design of both the water supply and drainage systems. Mr. Wyly gave freely of his time in addition to making available to the Committee certain unpublished information useful to the Committee in its considerations.

Mr. Harry Stevens, whose untimely death occurred during the work of the Committee, was one of the early contributors to the work. His technical competency in the field was well recognized by virtue of his force of personality. He should be accorded a large measure of recognition in the development of this Report.

Mr. Vincent T. Manas served as a liaison representative for the American Society of Mechanical Engineers at the time of the last meeting of the Technical Committee.

The Committee wishes to record its appreciation to the above individuals for the considerable help and assistance which they provided during the course of preparation of the Report.

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Basic Principles

This Code is founded upon certain basic principles of environmental sanitation and safety through properly designed, acceptably installed, and adequately maintained plumbing systems. Some of the details of plumbing construction may vary but the basic sanitary and safety principles desirable and necessary to protect the health of people are the same everywhere. As interpretations may be required, and as unforeseen situations arise which are not specifically covered in this Code, the 22 principles which follow shall be used to define the intent.

Principle No. 1—ALL OCCUPIED PREMISES SHALL HAVE POTABLE WATER

All premises intended for human habitation, occupancy, or use shall be provided with a supply of potable water. Such a water supply shall not be connected with unsafe water sources, nor shall it be subject to the hazards of backflow or back-siphonage.

Principle No. 2—ADEQUATE WATER REQUIRED

Plumbing fixtures, devices, and appurtenances shall be supplied with water in sufficient volume and at pressures adequate to enable them to function properly and without undue noise under normal conditions of use.

Principle No. 3—HOT WATER REQUIRED

Hot water shall be supplied to all plumbing fixtures which normally need or require hot water for their proper use and function.

Principle No. 4—WATER CONSERVATION

Plumbing shall be designed and adjusted to use the minimum quantity of water consistent with proper performance and cleaning.

Principle No. 5—DANGERS OF EXPLOSION OR OVERHEATING

Devices for heating and storing water shall be so designed and installed as to guard against dangers from explosion or overheating.

Principle No. 6—USE PUBLIC SEWER WHERE AVAILABLE

Every building with installed plumbing fixtures and intended for human habitation, occupancy, or use, and located on premises where a public sewer is on or passes said premises within a reasonable distance, shall be connected to the sewer.

Principle No. 7—REQUIRED PLUMBING FIXTURES

Each family dwelling unit shall have at least one water closet, one lavatory, one kitchen-type sink, and one bathtub or shower to meet the basic requirements of sanitation and personal hygiene.

All other structures for habitation shall be equipped with sufficient sanitary facilities. Plumbing fixtures shall be made of durable, smooth, nonabsorbent and corrosion resistant material and shall be free from concealed fouling surfaces.

Principle No. 8—DRAINAGE SYSTEM OF ADEQUATE SIZE

The drainage system shall be designed, constructed, and maintained to guard against fouling, deposit of solids, and clogging, and with adequate cleanouts so arranged that the pipes may be readily cleaned.

Principle No. 9—DURABLE MATERIALS AND GOOD WORKMANSHIP

The piping of the plumbing system shall be of durable material, free from defective workmanship and so designed and constructed as to give satisfactory service for its reasonable expected life.

Principle No. 10—LIQUID SEALED TRAPS REQUIRED

Each fixture directly connected to the drainage system shall be equipped with a liquid-seal trap.

Principle No. 11—TRAP SEALS SHALL BE PROTECTED

The drainage system shall be designed to provide an adequate circulation of air in all pipes with no danger of siphonage, aspiration, or forcing of trap seals under conditions of ordinary use.

Principle No. 12—EXHAUST FOUL AIR TO OUTSIDE

Each vent terminal shall extend to the outer air and be so installed as to minimize the possibilities of clogging and the return of foul air to the building.

Principle No. 13—TEST THE PLUMBING SYSTEM

The plumbing system shall be subjected to such tests as will effectively disclose all leaks and defects in the work or the material.

Principle No. 14—EXCLUDE CERTAIN SUBSTANCES FROM THE PLUMBING SYSTEM

No substance which will clog or accentuate clogging of pipes, produce explosive mixtures, destroy the pipes or their joints, or interfere unduly with the sewage-disposal process shall be allowed to enter the building drainage system.

Principle No. 15—PREVENT CONTAMINATION

Proper protection shall be provided to prevent contamination of food, water, sterile goods, and similar materials by backflow of sewage. When necessary, the fixture, device, or appliance shall be connected indirectly with the building drainage system.

Principle No. 16—LIGHT AND VENTILATION

No water closet or similar fixture shall be located in a room or compartment which is not properly lighted and ventilated.

Principle No. 17—INDIVIDUAL SEWAGE DISPOSAL SYSTEMS

If water closets or other plumbing fixtures are installed in buildings where there is no sewer within a reasonable distance, suitable provision shall be made for disposing of the sewage by some accepted method of sewage treatment and disposal.

Principle No. 18—PREVENT SEWER FLOODING

Where a plumbing drainage system is subject to backflow of sewage from the public sewer, suitable provision shall be made to prevent its overflow in the building.

Principle No. 19—PROPER MAINTENANCE

Plumbing systems shall be maintained in a safe and serviceable condition from the standpoint of both mechanics and health.

Principle No. 20—FIXTURES SHALL BE ACCESSIBLE

All plumbing fixtures shall be so installed with regard to spacing as to be accessible for their intended use and cleansing.

Principle No. 21—STRUCTURAL SAFETY

Plumbing shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls and other surfaces through fixture usage.

Principle No. 22—PROTECT GROUND AND SURFACE WATER

Sewage or other waste shall not be discharged into surface or sub-surface water unless it has first been subjected to some acceptable form of treatment.

CHAPTER I

Definitions

100. GENERAL

For the purpose of this Code, the following terms shall have the meaning indicated in this chapter. No attempt is made to define ordinary words which are used in accordance with their established dictionary meaning except where it is necessary to define their meaning as used in this Code to avoid misunderstanding.

101. DEFINITION OF TERMS

Administrative Authority

The individual official, board, department, or agency established and authorized by a State, county, city, or other political subdivision created by law to administer and enforce the provisions of the plumbing code as adopted or amended.

Air Break (Drainage System)

A piping arrangement in which a drain from a fixture, appliance, or device discharges indirectly into a fixture, receptacle, or interceptor at a point below the flood level rim of the receptacle.

Air Gap (Drainage System)

The unobstructed vertical distance through the free atmosphere between the outlet of waste pipe and the flood level rim of the receptacle into which it is discharging.

Air Gap (Water Distribution System)

The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture or other device and the flood level rim of the receptacle.

Anchors

See **Supports**.

Approved

Accepted or acceptable under an applicable specification stated or cited in this Code, or accepted as suitable for the proposed use under procedures and powers of the Administrative Authority.

Area Drain

A receptacle designed to collect surface or storm water from an open area.

Backflow

The flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any source or sources other than its intended source. Back-siphonage is one type of backflow.

Backflow Connection

Any arrangement whereby backflow can occur.

Backflow Preventer

A device or means to prevent backflow.

Backflow Preventer, Reduced Pressure Zone Type

An assembly of differential valves and check valves including an automatically opened spillage port to the atmosphere.

Back-Siphonage

The flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel or other sources into a water supply pipe due to a negative pressure in such pipe.

Battery of Fixtures

Any group of two or more similar adjacent fixtures which discharge into a common horizontal waste or soil branch.

Boiler Blow-Off

An outlet on a boiler to permit emptying or discharge of sediment.

Boiler Blow-Off Tank

A vessel designed to receive the discharge from a boiler blow-off outlet and to cool the discharge to a temperature which permits its safe discharge to the drainage system.

Branch

Any part of the piping system other than a main or stack.

Branch, Fixture

See **Fixture Branch**.

Branch, Horizontal

See **Horizontal Branch**.

Branch Interval

A distance along a soil or waste stack corresponding in general to a story height, but in no case less than 8 feet, within which the horizontal branches from one floor or story of a building are connected to the stack.

Branch Vent

A vent connecting one or more individual vents with a vent stack or stack vent.

Building

A structure having walls and a roof designed and used for the housing, shelter, enclosure, or support of persons, animals or property.

Building Classification

The arrangement adopted by the Administrative Authority for the designation of buildings in classes according to occupancy.

Building Drain

That part of the lowest piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer beginning 3 feet outside the building wall.

Building Drain—Combined

A building drain which conveys both sewage and storm water or other drainage.

Building Drain—Sanitary

A building drain which conveys sewage only.

Building Drain—Storm

A building drain which conveys storm water or other drainage but no sewage.

Building Sewer

That part of the drainage system which extends from the end of the building drain and conveys its discharge to a public sewer, private sewer, individual sewage-disposal system, or other point of disposal.

Building Sewer—Combined

A building sewer which conveys both sewage and storm water or other drainage.

Building Sewer—Sanitary

A building sewer which conveys sewage only.

Building Sewer—Storm

A building sewer which conveys storm water or other drainage but no sewage.

Building Subdrain

That portion of a drainage system which cannot drain by gravity into the building sewer.

Building Trap

A device, fitting, or assembly of fittings installed in the building drain to prevent circulation of air between the drainage system of the building and the building sewer.

Cesspool

A lined and covered excavation in the ground which receives the discharge of domestic sewage or other organic wastes from a drainage system, so designed as to retain the organic matter and solids, but permitting the liquids to seep through the bottom and sides.

Circuit Vent

A branch vent that serves two or more traps and extends from the downstream side of the highest fixture connection of a horizontal branch to the vent stack.

Code

These regulations, subsequent amendments thereto, or any emergency rule or regulation which the Administrative Authority having jurisdiction may lawfully adopt.

Combination Fixture

A fixture combining one sink and laundry tray or a two or three-compartment sink or laundry tray in one unit.

Combined Building Drain

See **Building Drain—Combined**.

Combined Building Sewer

See **Building Sewer—Combined**.

Combination Waste and Vent System

A specially designed system of waste piping embodying the horizontal wet venting of one or more sinks or floor drains by means of a common waste and vent pipe adequately sized to provide free movement of air above the flow line of the drain.

Common Vent

A vent connecting at the junction of two fixture drains and serving as a vent for both fixture and drains.

Conductor

A pipe inside the building which conveys storm water from the roof to a storm or combined building drain.

Continuous Vent

A vertical vent that is a continuation of the drain to which it connects.

Continuous Waste

A drain from two or more fixtures connected to a single trap.

Cross Connection

Any physical connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other either water of unknown or questionable safety or steam, gas, or chemical whereby there may be a flow from one system to the other, the direction of flow depending on the pressure differential between the two systems. (See **Backflow and Back-Siphonage**.)

Dead End

A branch leading from a soil, waste, or vent pipe, building drain, or building sewer, and terminating at a developed length of 2 feet or more by means of a plug, cap, or other closed fitting.

Department Having Jurisdiction

See **Administrative Authority**.

Developed Length

The length of a pipe line measured along the center line of the pipe or fittings.

Diameter

The nominal diameter as designated commercially.

Double Offset

Two changes of direction installed in succession or series in a continuous pipe.

Downspout

See **Leader**.

Domestic Sewage

The water-borne wastes derived from ordinary living processes.

Drain

Any pipe which carries waste water or water-borne wastes in a building drainage system.

Drainage Pipe

See **Drainage System**.

Drainage System

Includes all the piping, within public or private premises, which conveys sewage, rain water, or other liquid wastes to a legal point of disposal. It does not include the mains of a public sewer system or private or public sewage-treatment or disposal plant.

Building Gravity Drainage System

A drainage system which drains by gravity into the building sewer.

Sub-Building Drainage System

See **Building Subdrain**.

Dry Well

See **Leaching Well**.

Dual Vent

See **Common Vent**.

Durham System

A term used to describe soil or waste systems where all piping is of threaded pipe, tubing, or other such rigid construction, using recessed drainage fittings to correspond to the types of piping.

Dwelling Unit

One or more rooms with provision for living, sanitary and sleeping facilities arranged for the use of one family or individual.

Effective Opening

The minimum cross-sectional area at the point of water supply discharge, measured or expressed in terms of (1) diameter of a circle, or (2) if the opening is not circular, the diameter of a circle of equivalent cross-sectional area.

Existing Work

A plumbing system or any part thereof installed prior to the effective date of this Code.

Fire Line

A system of pipes and equipment used exclusively to supply water for extinguishing fires.

Fixture

See **Plumbing Fixture**.

Fixture Branch

A pipe connecting several fixtures.

Building Sewer—Storm

A building sewer which conveys storm water or other drainage but no sewage.

Building Subdrain

That portion of a drainage system which cannot drain by gravity into the building sewer.

Building Trap

A device, fitting, or assembly of fittings installed in the building drain to prevent circulation of air between the drainage system of the building and the building sewer.

Cesspool

A lined and covered excavation in the ground which receives the discharge of domestic sewage or other organic wastes from a drainage system, so designed as to retain the organic matter and solids, but permitting the liquids to seep through the bottom and sides.

Circuit Vent

A branch vent that serves two or more traps and extends from the downstream side of the highest fixture connection of a horizontal branch to the vent stack.

Code

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Combination Fixture

A fixture combining one sink and laundry tray or a two or three-compartment sink or laundry tray in one unit.

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Common Vent

A vent connecting at the junction of two fixture drains and serving as a vent for both fixture and drains.

Conductor

A pipe inside the building which conveys storm water from the roof to a storm or combined building drain.

Continuous Vent

A vertical vent that is a continuation of the drain to which it connects.

Continuous Waste

A drain from two or more fixtures connected to a single trap.

Cross Connection

Any physical connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other either water of unknown or questionable safety or steam, gas, or chemical whereby there may be a flow from one system to the other, the direction of flow depending on the pressure differential between the two systems. (See **Backflow and Back-Siphonage**.)

Dead End

A branch leading from a soil, waste, or vent pipe, building drain, or building sewer, and terminating at a developed length of 2 feet or more by means of a plug, cap, or other closed fitting.

Fixture Drain

The drain from the trap of a fixture to the junction of that drain with any other drain pipe.

Fixture Supply

The water supply pipe connecting a fixture to a branch water supply pipe or directly to a main water supply pipe.

Fixture Unit (Drainage-d.f.u.)

A common measure of the probable discharge into the drainage system by various types of plumbing fixtures. The drainage fixture-unit value for a particular fixture depends on its volume rate of drainage discharge, on the time duration of a single drainage operation, and on the average time between successive operations.

Fixture Unit (Supply-s.f.u.)

A common measure of the probable hydraulic demand on the water supply by various types of plumbing fixtures. The supply fixture-unit value for a particular fixture depends on its volume rate of supply, on the time duration of a single supply operation, and on the average time between successive operations.

Flood Level

See **Flood Level Rim**.

Flood Level Rim

The edge of the receptacle from which water overflows.

Flooded

When the liquid in a fixture or receptacle rises to the flood-level rim.

Flow Pressure

The pressure in the water supply pipe near the faucet or water outlet while the faucet or water outlet is wide-open and flowing.

Flush Valve

A device located at the bottom of a tank for flushing water closets and similar fixtures.

Flushometer Valve

A device which discharges a predetermined quantity of water to fixtures for flushing purposes and is actuated by direct water pressure.

Frostproof Closet

A hopper with no water in the bowl and with the trap and watersupply control valve located below frost line.

Fume Pipe

A conduit connecting a fuel burning appliance with the chimney flue.

Generally Accepted Standard

A specification, code, rule, guide, or procedure in the field of construction or related thereto, recognized and accepted as authoritative.

Grade

The fall (slope) of a line of pipe in reference to a horizontal plane. In drainage it is usually expressed as the fall in a fraction of an inch per foot length of pipe.

Grease Interceptor

See **Interceptor**.

Grease Trap

See **Interceptor**.

Hangers

See **Supports**.

Horizontal Branch Drain

A drain branch pipe extending laterally from a soil or waste stack or building drain, with or without vertical sections or branches, which receives the discharge from one or more fixture drains and conducts it to the soil or waste stack or to the building drain.

Horizontal Pipe

Any pipe or fitting which makes an angle of less than 45° with the horizontal.

Hot Water

Water at a temperature of not less than 120° F.

House Drain

See **Building Drain**.

House Sewer

See **Building Sewer**.

House Trap

See **Building Trap**.

Individual Sewage Disposal System

A system for disposal of domestic sewage by means of a septic tank, cesspool or mechanical treatment, designed for use apart from a public sewer to serve a single establishment or building.

Indirect Waste Pipe

A waste pipe which does not connect directly with the drainage system, but which discharges into the drainage system through an air break or air gap into a trap, fixture, receptacle or interceptor.

Individual Vent

A pipe installed to vent a fixture drain. It connects with the vent system above the fixture served or terminates outside the building into the open air.

Individual Water Supply

A supply other than an approved public water supply which serves one or more families.

Industrial Wastes

Liquid wastes resulting from the processes employed in industrial and commercial establishments.

Insanitary

Contrary to sanitary principles—injurious to health.

Interceptor

A device designed and installed so as to separate and retain deleterious, hazardous, or undesirable matter from normal wastes while permitting normal sewage or liquid wastes to discharge into the drainage system by gravity.

Installed

Altered, changed, or a new installation.

Leaching Well or Pit

A pit or receptacle having porous walls which permit the contents to seep into the ground.

Leader

An exterior drainage pipe for conveying storm water from roof or gutter drains.

Liquid Waste

The discharge from any fixture, appliance, area or appurtenance, which does not contain fecal matter.

Load Factor

The percentage of the total connected fixture unit flow which is likely to occur at any point in the drainage system. It varies with the type of occupancy, the total flow unit above this point being considered, and with the probability factor of simultaneous use.

Local Ventilating Pipe

A pipe on the fixture side of the trap through which vapor or foul air is removed from a room or fixture.

Loop Vent

A circuit vent which loops back to connect with a stack vent instead of a vent stack.

Main

The principal pipe artery to which branches may be connected.

Main Sewer

See **Public Sewer**.

Main Vent

The principal artery of the venting system to which vent branches may be connected.

Multiple Dwelling

Building containing two or more dwelling units.

Non-Potable Water

Water not safe for drinking, personal, or culinary use.

Nuisance

Public nuisance as known at common law or in equity jurisprudence; whatever is dangerous to human life or detrimental to health; whatever building, structure, or premise is not sufficiently ventilated, sewered, drained, cleaned, or lighted, in reference to its intended or actual use; and whatever renders the air or human food or drink or water supply unwholesome.

Offset

A combination of elbows or bends which brings one section of the pipe out of line but into a line parallel with the other section.

Person

A natural person, his heirs, executors, administrators or assigns; and includes a firm, partnership or corporation, its or their successors or assigns. Singular includes plural; male includes female.

Pitch

See **Grade**.

Plumbing

The practice, materials, and fixtures used in the installation, maintenance, extension, and alteration of all piping, fixtures, appliances, and appurtenances in connection with any of the following: Sanitary drainage or storm drainage facilities, the venting system and the public or private water supply systems, within or adjacent to any building structure, or conveyance; also the practice and materials used in the installation, maintenance, extension, or alteration of storm water, liquid waste, or sewerage, and water supply systems of any premises to their connection with the public sewer system or other acceptable disposal facility.

Plumbing Fixture

Installed receptacles, devices, or appliances either supplied with water or receive on discharge liquids, or liquid-borne wastes, or both.

Plumbing Inspector

See **Administrative Authority**.

Plumbing System

Includes the water supply and distribution pipes, plumbing fixtures and traps; soil, waste, and vent pipes; building drains and building sewers including their respective connections, devices, and appurtenances within the property lines of the premises, and water treating or water using equipment.

Pool

See **Swimming Pool**.

Potable Water

Water free from impurities present in amounts sufficient to cause disease or harmful physiological effects. Its bacteriological and chemical quality shall conform to the requirements of the Public Health Service Drinking Water Standards or the regulations of the public health authority having jurisdiction.

Private or Private Use

In the classification of plumbing fixtures, private applies to fixtures in residences and apartments and to fixtures in private bathrooms of hotels as well as similar installations in other buildings where the fixtures are intended for the use of a family or an individual.

Private Sewer

A sewer serving two or more buildings, privately owned, and not directly controlled by public authority.

Public or Public Use

In the classification of plumbing fixtures, public applies to fixtures in general toilet rooms of schools, gymnasium, hotels, railroad stations, public buildings, bars, public comfort stations, and other installations (whether pay or free) where a number of fixtures are installed so that their use is similarly unrestricted.

Public Official

See Administrative Authority.

Public Sewer

A common sewer directly controlled by public authority.

Public Water Main

A water supply pipe for public use controlled by public authority.

Receptor

A fixture or device which receives the discharge from indirect waste pipes.

Relief Vent

A vent so planned as to permit additional circulation of air between drainage and vent systems.

Return Offset

A double offset installed so as to return the pipe to its original alignment.

Revent Pipe

See Individual Vent.

Rim

An unobstructed open edge of a fixture.

Riser

A water supply pipe which extends vertically one full story or more to convey water to branches or to a group of fixtures.

Roof Drain

A drain installed to receive water collecting on the surface of a roof and to discharge it into a leader or a conductor.

Roughing-In

The installation of all parts of the plumbing system which can be completed prior to the installation of fixtures. This includes drainage, water supply, and vent piping, and the necessary fixture supports.

Safe Waste

See Indirect Waste.

Sand Interceptor

See Interceptor.

Sand Trap

See Interceptor.

Sanitary Sewer

A pipe which carries sewage and excludes storm, surface, and ground water.

Seepage Well or Pit

A covered pit with open-jointed lining through which the septic tank effluent it receives may seep or leach into the surrounding porous soil.

Separator

See **Interceptor**.

Septic Tank

A water-tight receptacle which receives the discharge of a building sanitary drainage system or part thereof, and is designed and constructed so as to separate solids from the liquid, digest organic matter through a period of detention, and allow the liquids to discharge into the soil outside of the tank through a system of open joint or perforated piping, or a seepage pit.

Sewage

Any liquid waste containing animal or vegetable matter in suspension or solution, and may include liquids containing chemicals in solution.

Sewage Ejectors

A device for moving sewage by entraining it in a high velocity steam, air or water jet.

Side Vent

A vent connecting to the drain pipe through a fitting at an angle not greater than 45° to the vertical.

Size of Pipe and Tubing

See **Diameter**.

Slope

See **Grade**.

Soil Pipe

A pipe which conveys sewage containing fecal matter to the building drain or building sewer.

Soil Vent

See **Stack Vent**.

Special Wastes

Wastes which require special treatment before entry into the normal plumbing system.

Special Waste Pipe

Pipes which convey special wastes.

Stack

A general term for any vertical line of soil, waste, vent, or inside conductor piping. This does not include vertical fixture and vent branches which do not extend through the roof or which pass through less than two stories before being reconnected to a vent stack or stack vent.

Stack Group

A group of fixtures located adjacent to the stack so that by means of proper fittings, vents may be reduced to a minimum.

Stack Vent

The extension of a soil or waste stack above the highest horizontal drain connected to the stack.

Stack Venting

A method of venting a fixture or fixtures through the soil or waste stack.

Storm Drain

See **Building Storm Drain**.

Storm Sewer

A sewer used for conveying rain water, surface water, condensate, cooling water, or similar liquid wastes.

Subsoil Drain

A drain which collects subsurface or seepage water and conveys it to a place of disposal.

Sump

A tank or pit, which receives sewage or liquid waste, located below the normal grade of the gravity system and which must be emptied by mechanical means.

Sump Pump

A mechanical device other than an ejector or bucket for removing sewage or liquid waste from a sump.

Supports

Devices for supporting and securing pipe, fixtures, and equipment.

Swimming Pool

Any structure, basin, chamber, or tank containing an artificial body of water for swimming, diving, or recreational bathing and having a depth of two feet or more at any point.

Trap

A fitting or device which provides a liquid seal to prevent the emission of sewer gases without materially affecting the flow of sewage or waste water through it.

Trap Seal

The vertical distance between the crown weir and the top of the dip of the trap.

Vacuum

Any pressure less than that exerted by the atmosphere.

Vacuum Breaker

See **Backflow Preventer**.

Vacuum Breaker, Non-Pressure Type (Atmospheric)

A vacuum breaker which is not designed to be subjected to static line pressure.

Vacuum Breaker, Pressure Type

A vacuum breaker designed to operate under conditions of static line pressure.

Vent Connector

See **Fume Pipe**.

Vent Pipe

Part of the vent system.

Vent Stack

A vertical vent pipe installed to provide circulation of air to and from the drainage system.

Vent System

A pipe or pipes installed to provide a flow of air to or from a drainage system or to provide a circulation of air within such system to protect trap seals from siphonage and back pressure.

Vertical Pipe

Any pipe or fitting which makes an angle of 45° or less with the vertical.

Wall Hung Water Closet

A wall mounted water closet installed in such a way that no part of the water closet touches the floor.

Waste

Liquid waste and industrial waste.

Waste Pipe

A pipe which conveys only waste.

Water Distributing Pipe

A pipe within the building or on the premises which conveys water from the water-service pipe to the point of usage.

Water Lifts

See **Sewage Ejector**.

Water Main

A water supply pipe for public use.

Water Outlet

A discharge opening through which water is supplied to a fixture, into the atmosphere (except into an open tank which is part of the water supply system), to a boiler or heating system, to any devices or equipment requiring water to operate but which are not part of the plumbing system.

Water Riser Pipe

See Riser.

Water Service Pipe

The pipe from the water main or other source of water supply to the water distributing system of the building served.

Water Supply System

The water service pipe, the water-distributing pipes, and the necessary connecting pipes, fittings, control valves, and all appurtenances in or adjacent to the building or premises.

Well, Bored

A well constructed by boring a hole in the ground with an auger and installing tile or other casing.

Well, Drilled

A well constructed by making a hole in the ground with a drilling machine of any type and installing casing and screen.

Well, Driven

A well constructed by driving a pipe in the ground. The drive pipe is usually fitted with a well point and screen.

Well, Dug

A well constructed by excavating a large diameter shaft, and installing casing where needed.

Wet Vent

A vent which receives the discharge of wastes other than from water closets.

Yoke Vent

A pipe connecting upward from a soil or waste stack to a vent stack for the purpose of preventing pressure changes in the stack.

CHAPTER II

General Regulations

200. TITLE

This document shall be known as the National Plumbing Code, (ASA number to be assigned).

201. CONFORMANCE WITH CODE

201.1 *New Buildings*

All plumbing materials, and plumbing systems or parts thereof installed hereafter shall meet or exceed the minimum provisions of this Code.

201.2 *Existing Buildings*

In existing buildings or premises in which plumbing installations are to be altered, renovated or replaced, such new materials and work shall meet or exceed the provisions of this Code. Where the Administrative Authority shall find that the full performance of bringing such work into compliance with all requirements of this Code, would result in exceptional or undue hardship by reason of excessive structural or mechanical difficulty, or impracticability, a deviation may be granted by the Administrative Authority only where, and to the extent, necessary to ameliorate such exceptional or undue hardship, and only where, and to the extent such deviation can be granted without impairing the intent and purpose of this Code. A record, open to inspection by the public, shall be maintained by the Administrative Authority of each and every deviation allowed under the terms of this section.

201.3 *Alternate Fixtures, Appurtenances, Materials, and Methods*

The Administrative Authority may approve the use of fixtures, appurtenances, materials, and methods of a type not conforming with the requirements of, nor expressly prohibited by, this Code after determination that such fixture, appurtenance, material, or method is of such design or quality, or both, as to appear to be suitable, safe, and sanitary for the use for which it is intended. A record of such instances shall be maintained and shall be available to the public. Action shall be taken within reasonable time to amend this Code so as to either authorize or prohibit such use. Any person desiring to install or use a fixture, appurtenance, material, or method of a type not conforming with the requirements of, nor expressly prohibited by, this Code shall, prior to such installation or use, submit to the Administrative Authority such proof as may be required to determine whether such fixture, appurtenance, material, or method is of such design or quality, or both, as to appear to be suitable, safe, and sanitary for the use for which it is intended. In the event the Administrative Authority determines that it does appear to be suitable, safe, and sanitary for the use for which it is intended, he may then permit such use: *Provided*, That the manner of installation or use is otherwise in accordance with this Code. In view of the special nature of these cases, such use shall be subject to periodic inspection by the Administrative Authority and such fixture, appurtenance, material, or method shall, upon order, be discontinued or removed if such inspection indicates it is unsuitable, unsafe, insanitary, or contrary to the provisions of these or other codes.

201.3.1 *Tests*

When there is insufficient evidence to verify claims for alternate materials the Administrative Authority may require as proof of suitability tests of compliance by an approved agency at the expense of the applicant.

201.3.2 Test Procedure

Tests shall be made in accordance with generally recognized standards; but in the absence of such standards, the Administrative Authority shall specify the test procedure.

201.3.3 Repeated Tests

The Administrative Authority may require tests to be repeated if, at any time, there is reason to believe that an alternate material no longer conforms to the requirements on which its approval was based.

202. CONFORMANCE WITH OTHER REGULATIONS

Nothing in this Code shall be construed to prevent the application of other ordinances or local regulations which prescribe higher plumbing standards.

203. HEALTH AND SAFETY

Where a health or safety hazard exists on a premise by reason of an existing plumbing installation or lack thereof, the owner or his agent shall install additional plumbing or make such corrections as may be necessary to abate such nuisance and bring the plumbing installation within the provisions of this Code.

203.1 Safety

Any part of a building or premise which is changed, altered, or required to be replaced as a result of the installation, alteration, renovation, or replacement of a plumbing system, or any part thereof, shall be left in a safe, nonhazardous condition.

203.1.1 Cutting or Notching

Any structural member unavoidably weakened or impaired by cutting, notching, or otherwise, shall be reinforced, repaired or replaced, so as to be left in a safe structural condition in accordance with the requirements of the Building Code or as required by the proper Administrative Authority.

203.1.2 Protection of Footings

Trenching installed parallel to footings shall not extend below the 45° bearing plane of the wall or footing.

204. WORKMANSHIP

Plumbing systems shall be installed in workmanlike manner conforming to generally accepted good practice.

205. CONDEMNED EQUIPMENT

Any plumbing equipment condemned by the Administrative Authority because of wear, damage, defects or sanitary hazards, shall not be re-used for plumbing purposes.

206. USED MATERIAL OR EQUIPMENT

It shall be unlawful to sell, offer for sale, purchase, or install any used plumbing material or equipment, unless it conforms to the standards and regulations set forth in this Code.

207. CONNECTIONS TO PLUMBING SYSTEMS REQUIRED

Every plumbing fixture, drain, appliance, or appurtenance thereto which is to receive or discharge any liquid wastes or sewage shall be connected to the drainage system of the building in accordance with the requirements of the Code.

208. CONNECTION TO PUBLIC WATER AND SEWER SYSTEM

208.1 General

The water distribution and drainage system of any building in which plumbing fixtures are installed shall be connected to a public water supply and sewer system respectively if available. Where either a public water supply or sewer system or both are not available, an individual water supply or individual sewage disposal system, or both shall be provided.

208.2 Public System Available

A public water supply system and/or public sewer system shall be deemed available to a premise used for human occupancy if such a premise is within 200 feet, measured along a street, alley, or easement, of the public water supply or sewer system and a connection conforming with the standards set forth in the Code may be made thereto.

209. EXCLUSION OF MATERIALS DETRIMENTAL TO THE SEWERAGE SYSTEM

209.1 Detrimental or Dangerous Materials

It shall be unlawful for any person to deposit by any means into the building drainage system or sewer any ashes, cinders, rags, inflammable, poisonous, or explosive liquids, gases, oils, grease, or any other material which would or could either obstruct, damage or overload such system or which could interfere with the normal operation of the sewage treatment processes.

209.2 Industrial Wastes

Waste products from manufacturing or industrial operations shall not be introduced into the public sewer system until it has been determined by the Administrative Authority or other authority having jurisdiction that the introduction thereof will not cause damage to the public sewer system or interfere with the functioning of the sewage treatment plant.

210. PLUMBING PLANS

All plans and specifications required to be submitted shall be examined by the Administrative Authority for acceptability under the provisions of this Code. The Administrative Authority shall give notice of its actions in writing to the person submitting the plans.

211. PIPING MEASUREMENTS

Except where otherwise specified in this Code all measurements shall be made to the center lines of the pipes.

212. WASHROOM AND TOILET ROOM REQUIREMENTS

212.1 Light and Ventilation

Washrooms and toilet rooms shall be illuminated to conform to standards of good lighting practice and be ventilated to the outside air or through an independent exhaust system.

212.2 Location of Fixtures and Piping

Piping, fixtures, or equipment shall not be located in such a manner as to interfere with the normal operation of windows, doors, or other exit openings.

213. STRAIN AND STRESSES IN PIPE

Piping in a plumbing system shall be installed so as to prevent strains and stresses which will exceed the structural strength of the pipe. Provision shall be made for expansion and contraction and for structural settlement that may affect the piping. Piping in concrete or masonry walls or footings shall be placed or installed in chases or recesses which will permit access to the piping for repair and replacement.

214. PROTECTION OF PIPES

214.1 Breakage

Pipes passing under or through walls shall be protected from breakage. Any plumbing pipe passing under a footing or through a foundation wall shall be provided with a relieving arch; or there shall be built into the masonry wall an iron-pipe sleeve two pipe sizes greater than the pipe passing through; or equivalent protection shall be provided as may be approved in writing by the Administrative Authority.

214.2 Corrosion

Pipe subject to corrosion by passing through or under corrosive fill, such as, but not limited to cinders, concrete, or other corrosive ma-

terial, shall be protected against external corrosion by protective coating, wrapping, or other means which will resist such corrosion.

214.3 Freezing

Water service piping and sewers shall be installed below recorded frost penetration but not less below grade than — feet — inches for water piping and — feet — inches for sewers. In climates with freezing temperatures, plumbing piping in exterior building walls shall be adequately protected against freezing by insulation or heat or both.

214.4 Trenching, Bedding, Tunneling and Backfilling

214.4.1 Trenching and Bedding

Trenches shall be of sufficient width to permit proper installation of the pipe. Where shoring is required ample allowance shall be made in trench width for proper working conditions. Where trenches are excavated to grade such that the bottom of the trench forms the bed for the pipe, care must be exercised to provide solid bearing between joints and Bell holes shall be provided at points where the pipe is joined. Where trenches are excavated below grade such that the bottom of the trench does not form the bed for the pipe, the trench shall be back-filled to grade with sand tamped in place so as to provide a uniform bearing for the pipe between joints. Where rock is encountered in trenching, it shall be removed to a point at least three inches below the grade line of the trench and the trench shall be back-filled to grade with sand tamped in place so as to provide a uniform bearing for the pipe between joints. Care shall be exercised to see that the pipe does not rest on rock at any point including the joints. If soft materials of poor bearing qualities are found at the bottom of the trench, a concrete foundation shall be provided to insure a firm foundation for the pipe. Such concrete foundation shall be bedded with sand tamped in place so as to provide a uniform bearing for the pipe between joints.

214.4.2 Tunneling

Where necessary, pipe may be installed by tunneling or jacking, or a combination of both. In such cases, special care shall be exercised to protect the pipe from damage either during installation or from subsequent uneven loading. Where earth tunnels are used, adequate supporting structures shall be provided to prevent future settling or caving. Pipe may be installed in larger conduit which has been jacked through unexcavated portions of the trench.

214.4.3 Backfilling

Until the crown of the pipe is covered by at least 2 feet of tamped earth considerable care shall be exercised in backfilling trenches. Loose earth, free of rocks, broken concrete, frozen chunks and other rubble, shall be carefully placed in the trench in 6-inch layers and tamped in place. Care shall be taken to thoroughly compact the backfill under and beside the pipe to be sure that the pipe is properly supported. Backfill shall be brought up evenly on both sides of the pipe so that it retains proper alignment.

214.4.4 Safety Precautions

All local rules and regulations pertaining to safety and protection of workmen, other persons in the vicinity, and neighboring property shall be observed where trenching, blasting, or other hazardous operations are being conducted.

215. SLEEVES

Annular space between sleeves and pipes shall be filled or tightly caulked with coal tar or asphaltum compound, lead, or other material found equally effective and approved as such by the Administrative Authority.

216. RATPROOFING

216.1 Drain Covers

All drain covers shall be designed and installed so that no opening is greater than $\frac{1}{2}$ inch in least dimension.

216.2 *Meter Boxes*

Meter boxes shall be constructed in such manner that rats cannot enter a building by following the service pipes from the box into the building.

216.3 *Openings for Water Service Pipes*

In or on buildings where openings have been made in walls, floors, or ceilings for the passage of pipes, they shall be closed and protected by the installation of approved metal collars securely fastened to the adjoining structure.

217. TOILET FACILITIES FOR WORKMEN

Suitable toilet facilities shall be provided and maintained in a sanitary condition for the use of workmen during construction.

CHAPTER III

Materials

300. PERFORMANCE REQUIREMENTS

300.1 *Approved Materials Required*

All materials used in the construction of any plumbing system, fixtures, or equipment shall be specified in the Code or approved in a rule or regulation promulgated by the Administrative Authority, acting pursuant to the Code.

300.2 *Local Conditions*

No person shall install a plumbing system any part of which contains any material or joint unless it has been determined by the Administrative Authority to be durable for the purpose for which it is intended at the location at which it is to be installed.

300.3 *Care in Installation*

All materials installed in plumbing systems shall be so handled and installed as to avoid damage so that the quality of the material will not be impaired.

300.4 *Other Requirements of This Code*

No material shall be installed in any plumbing system unless the material conforms with the minimum standards set forth in this Code or has been accepted by the Administrative Authority.

300.5 *No Defective Materials Permitted*

No defective or damaged materials, equipment or apparatus shall be installed nor shall such materials, equipment, or apparatus be maintained after the notice of the defect is observed and reported by the inspector.

301. MINIMUM STANDARDS

Materials shall conform at least to the standards cited in this chapter, which shall be considered minimum standards, when used in the construction, installation, alteration or repair of plumbing and drainage systems or parts thereof except that

- a. The Administrative Authority shall allow the extension, addition to or relocation of existing water, soil, waste or vent pipes with materials of like grade or quality as permitted in Section 201.2 or
- b. Materials not covered by the standards cited in this chapter may be used with the approval of the Administrative Authority as permitted in Section 201.3.

302. STANDARDS FOR PLUMBING MATERIALS

302.1 *Approved Materials*

A material shall be considered approved if it meets one or more of the standards cited in Table 303.1, Standards for Plumbing Materials, and in the case of plastic pipe, the standards of the National Sanitation Foundation. Materials not listed in Table 303.1 shall be used only as provided for in Section 201.3 or as permitted elsewhere in this Code.

302.1.1 Abbreviations

Abbreviations in Table 303.1 refer to the following organizations:

- ASA—American Standards Association
70 East 45th Street
New York 17, N.Y.
- ASTM—American Society for Testing and Materials
1916 Race Street
Philadelphia 3, Pa.
- AWWA—American Water Works Association
521 Fifth Avenue
New York 17, N.Y.
- CS—Commercial Standards
Commodity Standards Division
Office of Industry and Commerce
U.S. Department of Commerce
Washington 25, D.C.
- FS—Federal Supply Service
Standards Division
General Services Administration
Washington 25, D.C.
- NSF—National Sanitation Foundation
Ann Arbor, Mich.

302.1.2 Description of Terms of Standards

ASTM Standards are issued under fixed designations; the final number indicates the year of original adoption, or in the case of revision, the year of last revision. "T" indicates Tentative. In the "CS" series of standards, also, the final number indicates the year of issue. For Federal Specifications, the year indicated in Table 303.1 is that of the date of issue or that of the latest revision or amendment.

302.1.3 Changes in Standards

All standards and specifications for materials are subject to change. Designation carrying indication of the year of issue may thus become obsolete. Table 303.1 gives the full designations of standards current at the time this Code is printed. The Administrative Authority is required to review this table and have it brought up to date at intervals not exceeding two years.

303. IDENTIFICATION OF MATERIALS

Materials shall be identified as provided in the standards to which they conform.

TABLE 303.1.—Standards for Plumbing Materials

Description	ASA	ASTM	FS	Other
<i>Ferrous Pipe and Fittings</i>				
Cast iron soil pipe and fittings, extra heavy and service weights.	A40.1-1935	A74-42	WW-P-401(3)-1951	CS 188-59.
Cast iron water pipe.	A21.2-1953	None	WW-P-421a-1955	None.
Cast iron pipe, drainage, vent and waste.	None	None	WW-P-356-1936	None.
Cast iron pipe, pressure (50 lb.) (gas and water).	None	None	WW-P-360a-1959	None.
Cast iron (threaded) pipe.	A40.5-1943	None	WW-P-356-1936	None.
Cast iron (threaded) fittings.	B16.4-1949	None	WW-P-501c(1)-1957	None.
Cast iron drainage fittings.	B16.12-1953	None	WW-P-491a(1)-1946	None.
Galvanized pipe and fittings.	None	None	WW-P-406(1)-1945	None.
Malleable iron fittings (threaded), 150 lbs.	B16.3-1951	None	WW-P-521d-1959	None.
Open-hearth iron pipe, type III.	B36.23-1959	None	WW-P-521-1950	None.
Steel pipe, types I and II.	None	A120-62T	WW-P-406a-1957	None.
Steel pipe (seamless and welded, black and zinc coated) (galv.).	None	None	WW-P-404a-1956	None.
Union, pipe steel, or malleable iron, threaded pipe connection 250 psi, WSP, 500 psi WOC (cold, nonshock).	None	None	WW-O-531a-1957	None.
Unions; malleable iron or steel, 300 lb.	None	None	WW-U-536(1)-1933	CS7-29.
Wrought-iron pipe.	E56.2-1938	A72-62T	WW-P-441b(1)-1953	None.

TABLE 303.1.—Standards for Plumbing Materials—Continued

Description	ASA	ASTM	FS	Other
<i>Ferrous Pipe and Fittings—Continued</i>				
Valves, cast iron, gate, 125 and 250 lb. threaded and flanged.	None.....	None.....	WW-V-58(1)-1946...	None.
Pipe fittings, bronze and ferrous (bushings, plugs and locknuts); threaded.	None.....	None.....	WW-P-471(1)-1946...	None.
Nipples, pipe, threaded.....	None.....	None.....	WW-N-351a-1956...	CS 5-46.
<i>Nonferrous Pipe and Fittings</i>				
Brass tube.....	None.....	B135-62T...	WW-T-791(1)-1933...	None.
Brass pipe.....	None.....	B43-62...	WW-P-351(1)-1930...	None.
Brass or bronze flanges and flanged fittings, 150 and 300 lb.	B16.24-1953...	None.....	None.....	None.
Brass or bronze screwed fittings, 125 lb.	B16.15-1958...	None.....	WW-P-460-1945...	None.
Cast-brass solder joint fittings.	B16.18-1950...	None.....	None.....	None.
Cast-brass solder joint drainage fittings.	B16.23-1960...	None.....	None.....	None.
Copper pipe.....	None.....	B42-62...	WW-P-377b(1)-1955...	None.
Copper pipe, threadless.....	None.....	B302-62...	None.....	None.
Seamless copper tube.....	None.....	B75-62...	WW-T-707a-1958...	None.
Copper water tube, types K, L, M.	H23.1-1959...	B88-58...	WW-T-709a(1)-1946...	None.
Copper drainage tube, type DWV.	None.....	B306-62...	None.....	CS229-60.
Wrought copper and wrought bronze solder joint fittings.	B16.22-1951...	None.....	None.....	MSS-SP-64.
Flared fittings for copper water tube.	B16-26-1958...	None.....	None.....	None.
Lead pipe and trays.....	None.....	None.....	WW-P-325-1944...	CS95-41 and 306-41.
Unions, brass or bronze, 250 lbs.	None.....	None.....	WW-U-516-1933...	None.
Valves, bronze; angle, check and globe, 125 and 150 lbs., threaded and flanged.	None.....	None.....	WW-V-51a(2)-1954...	None.
Valves, bronze; gate, 125 and 150 lbs., threaded and flanged.	None.....	None.....	WW-V-54(2)-1954...	None.
Pipe fittings, bronze and ferrous (bushings, plugs and locknuts); threaded.	None.....	None.....	WW-P-471(1)-1946...	None.
Plastic pipe and fittings (water supply).	None.....	D1785-60T...	None.....	NSF.
Plastic pipe and fittings (sewer, drain and waste).	None.....	None.....	UM-26, UM-33...	CS197-60, CS206-57, CS207-60.
<i>Nonmetallic Pipe and Fittings</i>				
Asbestos cement nonpressure (sewer) pipe. ¹	None.....	C428-63T...	SS-P-331b...	None.
Asbestos cement pressure (water) pipe.	None.....	C-296-63T...	SS-P-351a-1953...	AWWAC-400-53T.
Bituminized fiber sewer pipe and fittings.	None.....	D1861-61T...	SS-P-356-1955...	CS116-54.
Clay drain tile.	None.....	D1862-61T...	SS-T-310-1942...	CS226-59.
Concrete sewer pipe, reinforced.	None.....	C4-59T...	SS-T-310-1942...	None.
Concrete sewer pipe, nonreinforced.	None.....	C76-62T...	SS-P-375-1956...	None.
Concrete pipe, pressure, reinforced concrete, pretensioned reinforcement (steel cylinder type).	None.....	C76-62T...	SS-P-371a-1956...	None.
Vitrified clay sewer pipe, standard strength.	A106.3-1958...	C13-57T...	SS-P-361b-1956...	None.
Vitrified clay sewer pipe, extra strength.	None.....	C200-59T...	SS-P-361b-1956...	None.
Vitrified clay sewer pipe, standard strength.	A106.4-1958...	C261-60T...	SS-P-361b-1956...	None.
Vitrified clay sewer pipe, unglazed, extra strength.	None.....	C-278...	SS-P-361b...	None.
Vitrified clay sewer pipe, ceramic glazed, standard strength.	None.....	C-462...	SS-P-361b...	None.
Vitrified clay sewer pipe, ceramic glazed, extra strength.	None.....	C463-60T...	SS-P-361b-1956...	None.
Vitrified clay sewer pipe, perforated standard strength.	A106.1-1958...	C211-6T...	None.....	CS143-59.

¹ Asbestos cement building sewer pipe shall meet Federal Specification SS-P-331b or ASTM standard C 428-63T expanded as follows:

Additional sizes 4" and 5".
No hydrostatic test for building sewer service.

Flexural strength:

Size	Length	Class 1500	Class 2400	Class 3300
4"	10'	550	775	1100
4"	13'	750	1000	1350
5"	10'	850	1375	1900
5"	13'	1250	1775	2350
6"	10'	1500	1700	2100
6"	13'	2000	2200	2600

Crushing strength: Include 4" and 5" for Class 1500, 2400, and 3300.
Crushing test: One specimen from each 300 lengths of 4", 5", and 6" size pipes.

TABLE 303.1.—Standards for Plumbing Materials—Continued

Description	ASA	ASTM	FS	Other
<i>Plumbing Fixtures</i>				
Drinking fountains.....	Z4.2-1942.....	None.....	None.....	None.....
Enameled cast-iron plumbing fixtures.....	None.....	None.....	None.....	CS77-56.....
Earthenware (vitreous glazed) plumbing fixtures.....	None.....	None.....	None.....	CS111-43.....
Formed steel enameled sanitary ware.....	None.....	None.....	WW-P-541b(2)-1958.....	None.....
Formed metal porcelain enameled sanitary ware.....	None.....	None.....	WW-P-541b(2)-1958.....	None.....
Heaters, water, instantaneous (steam-water converter type).....	None.....	None.....	WW-H-101-1954.....	None.....
Plumbing fixtures (for) land use.....	None.....	None.....	WW-P-541b(2)-1958.....	None.....
Staple porcelain plumbing fixtures.....	None.....	None.....	None.....	CS4-29.....
Staple vitreous china plumbing fixtures.....	None.....	None.....	None.....	CS20-56.....
Still, water, portable (without heating device) for U.S.P. "distilled water".....	None.....	None.....	RR-S-726(1)-1930.....	None.....
Porcelain-enameled tanks for domestic use.....	None.....	None.....	None.....	CS115-60.....
<i>Miscellaneous Materials and Standards</i>				
Automatic relief valves.....	Z21.22-1958.....	None.....	None.....	None.....
Air gap standards.....	A40.4-1942.....	None.....	None.....	None.....
Backflow preventers.....	A40.6-1943.....	None.....	None.....	None.....
Brass cleanout plugs.....	None.....	None.....	WW-P-401(3)-1951.....	None.....
Caulking lead, type I.....	None.....	None.....	QQ-L-156(1)-1946.....	CS94-41.....
Cement lining.....	A21.4-1953.....	None.....	WW-P-406a-1957.....	None.....
Coal-tar enamel, protective coating.....	None.....	None.....	None.....	A W W A C204-51.....
Fixture setting compound.....	None.....	None.....	HH-C-536a-1954.....	None.....
Flange dimensions, standard (classes 125 and 250 cast iron flanges, classes 150, 250 and 300 bronze flanges) (land use).....	None.....	None.....	WW-F-406a(1)-1949.....	None.....
Galvanized iron and steel sheets.....	G3.8-1937.....	A163-60T.....	QQ-I-716(3)-1948.....	None.....
Gaskets, plumbing-fixture-setting.....	None.....	None.....	HH-G-116-1936.....	None.....
Hangers and supports, pipe.....	None.....	None.....	WW-H-171 B-1959.....	None.....
Hose clamps.....	None.....	None.....	WW-C-440a-1950.....	None.....
Pipe, conductor, eaves, trough, and fittings.....	None.....	None.....	None.....	None.....
Resilient joints.....	None.....	C425-60T.....	None.....	None.....
Rubber gaskets (concrete sewer pipe).....	None.....	C443-62T.....	None.....	None.....
Sheet brass.....	None.....	B36-61 and B121-66.....	QQ-B-613a-1957.....	None.....
Sheet copper.....	None.....	B152-60.....	None.....	None.....
Sheet lead, grade A.....	None.....	None.....	QQ-L-201a(1)-1953.....	None.....
Soft solder.....	None.....	B32-60dT.....	QQ-S-571c-1958.....	None.....
Steel septic tanks.....	None.....	None.....	None.....	CS177-51.....
Traps, steam, thermostatic (for land use).....	None.....	None.....	WW-T-696a-1956.....	None.....
Valve: radiator, air, thermostatic (gravity steam heating systems).....	None.....	None.....	WW-V-151(1)-1938.....	None.....
Domestic hot water heaters.....	Z21.10-1952.....	None.....	W-H-196-1932.....	None.....

304. PIPING SYSTEM MATERIALS

304.1 Water Supply Systems

304.1.1 Allowance for Character of Soil and Water

When selecting the material and size for water service supply pipe, tubing, or fittings, due consideration shall be given to the action of the water on the interior of the pipe and of the soil, fill, or other material on the exterior of the pipe.

304.1.2 Water Service Pipe

Water service pipe shall be made of asbestos cement, brass or copper pipe, copper tubing, cast iron water pipe, wrought iron, lead, open-hearth iron, plastic, or steel. All threaded ferrous pipe and fittings shall be galvanized or cement lined. When used underground in corrosive soil or fill, all ferrous pipe and fittings shall be coal-tar enamel coated and threaded joints shall be coated and wrapped when installed.

304.1.3 Water Distribution System Pipe

Water distribution system pipe shall be made of brass or copper pipe, copper tubing, galvanized wrought iron pipe, galvanized open-

hearth iron pipe, galvanized steel pipe or exposed plastic cold water pipe.

304.2 Drainage Systems

304.2.1 Above Ground Piping Within Buildings

Soil and waste piping above ground in buildings shall be of brass or copper pipe, copper tubing, extra heavy or service weight cast iron, galvanized wrought iron, galvanized open-hearth iron, galvanized steel or lead.

304.2.2 Underground Building Drains (Sanitary and Storm)

All underground building drains, except as provided for in Section 304.2.6 shall be of cast iron, service weight for buildings four stories and under and extra heavy weight for buildings over four stories. The Administrative Authority may, however, permit use of galvanized steel, galvanized ferrous alloy, lead or copper pipe or tube, or other authorized material. Where threaded joints are used underground, they shall be coal-tar coated and wrapped when installed.

304.2.3 Building Sewer

- a. In Trench Separate From Water Service: If the building sewer is installed in a trench separate from the water service, the sewer pipe material shall be of either asbestos cement, bituminized fiber, cast iron, concrete, or vitrified clay or other authorized material. Joints shall be watertight and root proof.
- b. In Trench with Water Service: If the building sewer is installed in the same trench as the water service, the sewer pipe material shall be durable, corrosion resistant, and so installed as to remain watertight and root proof. The sewer shall be tested with a 10-foot head of water or equivalent and found to be tight. The conditions in Section 1001.2.1 shall also be met.

304.2.4 Sewer or Drain in Filled Ground

When a building sewer or building drain is installed in filled or unstable ground it shall be of cast iron except that nonmetallic drains may be used if laid on an approved continuous supporting system.

304.2.5 Existing Building Sewers and Drains

Existing building sewers and drains may be used in connection with new building sewer and drainage systems only when found by examination and test to conform to the new system in quality of material prescribed by this Code, and the Administrative Authority shall notify the owner to make the changes necessary to conform to this Code.

304.2.6 Underground Building Storm Drains

Building storm drains underground, inside the building, when connected to a sanitary building drain or combined sewer, shall be of cast iron soil pipe as provided for in Section 304.2.2. Building storm drains underground, inside the building, when not connected with a sanitary or combined sewer shall be of cast iron soil pipe or ferrous alloy piping except that when approved by the Administrative Authority, vitrified clay pipe, concrete pipe, bituminized fiber pipe and asbestos cement pipe, may be used.

304.2.7 Building Storm Sewer

The building storm sewer shall be of cast iron soil pipe, vitrified clay pipe, concrete pipe, bituminized fiber pipe, plastic pipe, or asbestos cement pipe.

304.2.8 Chemical Wastes

Separate drainage systems for chemical wastes shall be of corrosion resistant material approved by the Administrative Authority. Materials acceptable for chemical waste drainage systems include prestressed, low-expansion, boro-silicate glass pipe; high silicon content cast iron pipe; plastic pipe; plastic lined pipe; and lead pipe.

304.3 Venting Systems

304.3.1 Above Ground Venting

Vent piping installed above ground shall be of brass or copper, copper tube, cast iron, ferrous alloys, galvanized steel, galvanized wrought iron or lead.

304.3.2 Underground Venting

Underground vent piping shall be of cast iron except that the Administrative Authority may approve the use of other materials. Where threaded joints are used underground they shall be coated and wrapped after installation and tests.

304.3.3 Acid Systems

Vent piping on acid-waste systems shall conform to that required for acid-waste pipe, except as may be found adequate by the Administrative Authority.

304.4 Fittings

The materials of which water supply, drainage, and venting system pipe fittings are made shall conform to the type of piping material used in the water supply, drainage or venting system. The fittings shall have no ledges, shoulders, or reductions which can retard or obstruct flow in the piping. Threaded drainage pipe fittings shall be of the recessed drainage type.

304.5 Other Piping Systems

304.5.1 Roof Drains

Roof drains shall be of cast iron, copper, lead or other corrosion resistant material approved by the Administrative Authority.

304.5.2 Inside Conductors

Inside conductors installed above ground level shall be of brass or copper pipe, copper tubing, cast iron, lead or galvanized open-hearth iron, galvanized steel or wrought iron.

304.5.3 Leaders (Downspouts)

Leaders shall be of approved sheet metal or other acceptable material except that on buildings not exceeding three stories in height approved wood leaders may be installed.

304.5.4 Subsoil Drains

Subsoil drains shall be of open jointed or horizontally split or perforated clay tile; perforated asbestos cement or bituminized fiber pipe, or plastic pipe; or open jointed cast iron soil pipe.

305. SPECIAL MATERIALS

305.1 Sheet Lead

Sheet lead for the following uses shall weigh not less than:

- a. General use—4 pounds per square foot
- b. Safe pans—4 pounds per square foot
- c. Flashings for vent pipes—3 pounds per square foot

305.2 Lead Bends and Traps

The walls of lead bends and traps shall be at least one-eighth ($\frac{1}{8}$) inch thick.

305.3 Sheet Copper

Sheet copper for the following uses shall weigh not less than:

- a. General use—12 ounces per square foot
- b. Flashing for vent pipes—8 ounces per square foot
- c. Flush tank linings—10 ounces per square foot

305.4 Calking Ferrules

Calking ferrules shall be of red brass and shall be in accordance with the following table:

Pipe sizes, inches	Inside diameter, inches	Length, inches	Minimum weight each
2	2 $\frac{1}{4}$	4 $\frac{1}{2}$	1 lb. 0 oz.
3	3 $\frac{1}{4}$	4 $\frac{1}{2}$	1 lb. 12 oz.
4	4 $\frac{1}{4}$	4 $\frac{1}{2}$	2 lb. 8 oz.

305.5 Soldering Bushings

Soldering bushings shall be of red brass in accordance with the following table:

Pipe sizes, inches	Minimum weight each
1 $\frac{1}{4}$	6 oz.
1 $\frac{1}{2}$	8 oz.
2	14 oz.
2 $\frac{1}{2}$	1 lb. 6 oz.
3	2 lb. 0 oz.
4	3 lb. 8 oz.

305.6 Floor Flanges

Floor flanges for water closets or similar fixtures shall be not less than $\frac{1}{4}$ inch thick for brass, $\frac{1}{4}$ inch thick and not less than 2 inch calking depth for cast iron or galvanized malleable iron.

If of hard lead, they shall weigh not less than 1 lb. 9 oz. and be composed of lead alloy with not less than 7.75 percent Antimony by weight. Flanges shall be soldered to lead bends, or shall be calked, soldered or threaded into other metal. Closet screws and bolts shall be brass.

305.7 Cleanout Plugs

Cleanout plugs shall be of brass and shall have raised square or countersunk square heads except that where raised heads will cause a tripping hazard countersunk heads shall be used.

305.8 Flush Pipes and Fittings

Flush pipes and fittings shall be of nonferrous material. When of brass or copper tubing, the material shall be at least 0.0313 inches in thickness (No. 20 U.S. gauge).

306. FIXTURE MATERIALS

306.1 Quality of Fixtures

Plumbing fixtures shall be constructed from approved materials, have smooth, impervious surfaces, be free from defects and concealed fouling surfaces, and, except as permitted elsewhere in the Code, shall conform to the standards cited in Table 303.1, Standards for Plumbing Materials.

306.2 Special Use Fixtures

Special use fixtures not otherwise covered in this Code may be made of stainless steel, soapstone or chemical stoneware, plastic or may be lined with lead, copper-base alloy, nickel-copper alloy, corrosion resisting steel or other materials especially suited to the use for which the fixture is intended.

CHAPTER IV

Joints and Connections

400. TYPES OF JOINTS FOR PIPING MATERIALS

400.1 *Brazed or Welded*

Every brazed or welded joint shall be made by first cleaning down to the base metal the surfaces to be welded or brazed, applying flux approved for such joints and making the joint with approved brazing alloy.

400.2 *Burned Lead*

Every burned (welded) lead joint shall be lapped and the lead shall be fused together to form a uniform weld at least as thick as the lead being joined.

400.3 *Calked*

400.3.1 *Cast Iron Soil Pipe*

Every lead calked joint for cast iron bell and spigot soil pipe shall be firmly packed with oakum or hemp and filled with molten lead not less than 1 inch deep and not to extend more than $\frac{1}{4}$ inch below the rim of the hub. No paint, varnish, or other coatings shall be permitted on the jointing material until after the joint has been tested and approved. Lead shall be run in one pouring and shall be calked tight.

400.3.2 *Cast Iron Water Pipe*

Every lead calked joint for cast iron bell and spigot water pipe shall be firmly packed with clean, sound asbestos rope or treated paper rope. The remaining space in the hub shall be filled with molten lead according to the following schedule:

Pipe size	Depth of lead
Up to 20 inches	2 $\frac{1}{4}$ inches
24, 30, 36 inches	2 $\frac{1}{2}$ inches
Larger than 36 inches	3 inches

Lead shall be run in one pouring and shall be calked tight.

400.4 *Cement*

Except for repairs and connections to existing lines constructed with such joints, cement mortar joints are prohibited on building sewers less than eight (8) inches in diameter.

Where permitted, cement mortar joints shall be made in the following manner: A layer of jute or hemp shall be inserted into the base of the annular joint space and packed tightly to prevent mortar from entering the interior of the pipe or fitting. Not more than twenty-five (25) percent of the annular space shall be used for jute or hemp. The remaining space shall be filled in one continuous operation with a thoroughly mixed mortar composed of one (1) part cement and two (2) parts sand, with only sufficient water to make the mixture workable by hand. Additional mortar of the same composition shall then be applied to form a one (1) to one (1) slope with the barrel of the pipe. The bell or hub of the pipe shall be left exposed and when necessary the interior of the pipe shall be swabbed to remove any mortar or other material which may have found its way into such pipe.

400.5 *Expansion*

Every expansion joint shall be of approved type and its material shall conform with the type of piping in which it is installed.

400.6 Flared

Every flared joint for soft-copper water tubing shall be made with fittings meeting approved standards. The tubing shall be expanded with a proper flaring tool.

400.7 Hot Poured

Hot poured compound for clay or concrete sewer pipe or other materials shall not be water absorbent and when poured against a dry surface shall have a bond of not less than 100 psi. All surfaces of the joint shall be cleaned and dried before pouring. If wet surfaces are unavoidable, a suitable primer shall be applied. The compound shall not soften sufficiently to destroy the effectiveness of the joint when subjected to a temperature of 160 degrees F. nor be soluble in any of the waste carried by the drainage system. Approximately 25 percent of the joint space at the base of the socket shall be filled with jute or hemp. A pouring collar, rope or other device shall be used to hold the hot compound during pouring. Each joint shall be poured in one operation until the joint is filled. Joints shall not be tested until one hour after pouring.

400.8 Mechanical (Flexible or Slip Joint)

400.8.1 Asbestos Cement Pipe

Every joint in asbestos cement pipe shall be made with sleeve couplings of the same composition as the pipe, sealed with rubber rings. Joints between asbestos cement pipe and metal pipe shall be made by means of an adapter coupling calked as required in Section 400.3.

400.8.2 Cast Iron Pipe

Every mechanical joint in cast iron pipe shall be made with a flanged collar, rubber ring gasket and appropriate number of securing bolts or with a preformed molded ring secured by pulling the pipe together in such a way as to compress the molded ring.

400.8.3 Clay Pipe

Flexible joints between lengths of clay pipe may be made using approved resilient materials both on the spigot end and in the bell end of the pipe.

400.8.4 Concrete pipe

Flexible joints between lengths of concrete pipe may be made using approved rubber materials both on the spigot end and in the bell end of the pipe.

400.9 Plastic

Every joint in plastic piping shall be made with approved fittings by either solvent welded or fusion welded connections or with approved insert fittings and metal clamps and screws of corrosion resistant material.

400.10 Precast

Every precast collar shall be formed in both the spigot and bell of the pipe in advance of use. Collar surfaces shall be conical with side slopes of 3 degrees with the axis of the pipe and the length shall be equal to the depth of the socket. Prior to making joint contact, surfaces shall be cleaned and coated with solvents and adhesives as recommended in the standard. When the spigot end is inserted in the collar, it shall bind before contacting the base of the socket. Material shall be inert and resistant to both acids and alkalies.

400.11 Slip

Every slip joint shall be made using approved packing or gasket material, or approved ground joint brass compression rings. Ground joint brass connections which allow adjustment of tubing but provide a rigid joint when made up shall not be considered as slip joints.

400.12 Soldered or Sweat

Every soldered or sweat joint for tubing shall be made with approved fittings. Surfaces to be soldered or sweated shall be cleaned bright. The joints shall be properly fluxed and made with approved solder. Joints in copper water tubing shall be made by the appropriate use of approved brass or wrought copper water fittings, properly sweated or soldered together.

400.13 Tapered Couplings

Every joint in bituminized fiber pipe shall be made with tapered type couplings of the same material as the pipe. Joints between bituminized fiber pipe and metal pipe shall be made by means of an adapted coupling calked as required in Section 400.3.

400.14 Threaded

Every threaded joint shall conform to American National Taper Pipe Thread, ASA B2.1-1945 or FS GGG-P-351a. All burrs shall be removed. Pipe ends shall be reamed or filed out to size of bore, and all chips shall be removed. Pipe joint cement and paint shall be used only on male threads.

400.15 Union

Every union shall have metal to metal ground seats and their material shall conform to the type of piping in which they are installed.

400.16 Wiped

Every joint in lead pipe or fittings, or between lead pipe or fittings and brass or copper pipe, ferrules, solder nipples, or traps, shall be full wiped joints. Wiped joints shall have an exposed surface on each side of a joint not less than $\frac{3}{4}$ inch and at least as thick as the material being jointed. Wall or floor flange lead-wiped joints shall be made by using a lead ring or flange placed behind the joints at wall or floor. Joints between lead pipe and cast iron, steel, or wrought iron shall be made by means of a calking ferrule, soldering nipple, or bushing.

401. TYPES OF JOINTS BETWEEN DIFFERENT PIPING MATERIALS

401.1 Cast Iron to Copper Tubing

Every joint between cast iron and copper tubing shall be made either by directly calking the copper tubing into the bell of the cast iron pipe or by using a brass calking ferrule and properly sweating the copper tubing to the ferrule.

401.2 Cast Iron to Vitrified Clay

Every joint between cast iron piping and vitrified clay piping shall be made either of hot poured bitumastic compound or by a preformed bituminous ring. This ring shall, after ramming, completely fill the annular space between the cast iron spigot and the vitrified clay hub.

401.3 Copper Tubing to Threaded Pipe Joints

Every joint from copper tubing to threaded pipe shall be made by the use of brass converter fittings. The joint between the copper pipe and the fitting shall be properly sweated or soldered, and the connection between the threaded pipe and the fitting shall be made with a standard pipe size screw joint.

401.4 Lead to Cast Iron, Wrought Iron, or Steel

Every joint between lead and cast iron, wrought iron, or steel pipe shall be made by means of wiped joints to a calking ferrule, soldering nipple, bushing, or by means of a mechanical adapter.

401.5 Threaded Pipe to Cast Iron

Every joint between wrought iron, steel, or brass, and cast iron pipe shall be either calked or threaded or shall be made with approved adapter fittings.

402. CONNECTIONS BETWEEN DRAINAGE PIPING AND CERTAIN FIXTURES

Every connection between drainage pipes and water closets, floor outlet service sinks, pedestal urinals, and earthenware trap standards or any other fixture with floor outlet, shall be made by means of brass, hard-lead, or iron flanges, calked, soldered, or screwed to the drainage pipe. The connection shall be bolted, with an approved gasket or washer or setting compound between the earthenware and the connection. The floor flange shall be set on an approved firm base. The use of commercial putty or plaster is prohibited.

403. TIGHTNESS

Joints and connections in the plumbing system shall be gastight and watertight for the pressure required by test, with the exceptions of those portions of perforated or open joint piping which are installed for the purpose of collecting and conveying ground or seepage water to the underground storm drains.

404. WATERPROOFING OF OPENINGS

Joints at the roof, around vent pipes, shall be made watertight by the use of lead, copper, aluminum, or other approved flashings or flashing material. Exterior wall openings shall be made watertight.

CHAPTER V

Traps and Cleanouts

500. FIXTURE TRAPS

500.1 *Separate Traps for Each Fixture*

Each plumbing fixture shall be separately trapped by a water seal trap placed as close as possible to the fixture outlet. The vertical distance from the fixture outlet to the trap weir shall not exceed 24 inches. No fixture shall be double trapped. Exceptions to the separate trapping requirements are as follows:

- a. Fixtures having integral traps.
- b. A combination plumbing fixture may be installed on one trap provided one compartment is not more than 6 inches deeper than the other and the waste outlets are not more than 30 inches apart and neither outlet is equipped with a garbage grinder.
- c. One trap may be installed for a set of not more than three single compartment sinks, laundry trays, or lavatories immediately adjacent to each other in the same room, and the trap is centrally located when three such fixtures are installed.

500.2 *Size of Fixture Traps*

Fixture trap size (nominal diameter) shall be sufficient to drain the fixture rapidly and in no case less than given in Table 500.2, Size of Fixture Traps for Different Type Plumbing Fixtures. No trap shall be larger than the drainage pipe into which it discharges.

TABLE 500.2.—Size of fixture traps for different type plumbing fixtures

<i>Plumbing fixture</i>	<i>Trap size in inches</i>
Bathtub (with or without overhead shower).....	1½
Bidet.....	1½
Combination sink and wash (laundry) tray.....	1½
Combination sink and wash (laundry) tray with food waste grinder unit.....	1½
Dental unit or cuspidor.....	1½
Dental lavatory.....	1½
Drinking fountain.....	1
Dishwasher, commercial.....	2
Dishwasher, domestic.....	1½
Floor drain.....	2
Food waste grinder.....	1½
Kitchen sink, domestic, with food waste grinder unit.....	1½
Kitchen sink, domestic.....	1½
Lavatory, common.....	1½
Lavatory (barber shop, beauty parlor or surgeon's).....	1½
Lavatory, multiple type (wash fountain or wash sink).....	1½
Laundry tray (1 or 2 compartments).....	1½
Shower stall.....	1½
Sink (surgeon's).....	1½
Sink (flushing rim type, flush valve supplies).....	3
Sink (service type with floor outlet trap standard).....	3
Sink (service trap with P trap).....	2
Sink, commercial (pot, scullery, or similar type).....	2
Sink, commercial (with food grinder unit).....	2
Urinal (pedestal, syphon jet, or blowout type, flush valve supplied).....	3
Urinal (stall type).....	2
Urinal (wall lip type, flush tank supplied).....	1½
Water closet.....	3

*Separate trap required for wash tray and separate trap required for sink compartment with food waste grinder unit.

500.3 Prohibited Traps

The following type traps are prohibited:

- a. Traps which depend upon moving parts to maintain their seal.
- b. Bell traps.
- c. Crown vented traps.
- d. Separate fixture traps which depend on interior partitions for their seal.
- e. "S" Traps

500.4 Design of Traps

Fixture traps shall be self scouring and shall have no interior partitions except where such traps are integral with the fixture. Slip joints or couplings may be used on the trap inlet or within the trap seal of the trap if a metal-to-metal ground joint is used.

500.5 Trap Seal

Each fixture trap shall have a liquid seal of not less than 2 inches and not more than 4 inches, except where for special conditions, a deeper seal may be required by the Administrative Authority.

500.6 Trap Setting and Protection

Traps shall be set level with respect to their water seals and, where necessary, shall be protected from freezing.

500.7 Building Traps

Building (House) traps shall not be installed except where required by the Administrative Authority. Each building trap when installed shall be provided with a cleanout and with a relieving vent or fresh air intake which need not be larger than one-half the diameter of the drain to which it connects.

500.8 Acid Resisting Traps

Where a vitrified-clay or other brittleware, acid-resisting trap is installed underground, it shall be embedded in concrete extending 6 inches beyond the bottom and sides of the trap.

501. DRAINAGE PIPE CLEANOUTS

501.1 Location

Cleanouts shall be not more than 50 feet apart in horizontal drainage lines of 4-inch nominal diameter or less and not more than 100 feet apart for larger pipes.

501.2 Underground Drainage

Cleanouts, when installed on an underground drain, shall be extended vertically to or above the finished grade level or the cleanout may be extended outside the building when found necessary by the Administrative Authority.

501.3 Change of Direction

Accessible cleanouts shall be installed at each change of direction of the building drain greater than 45 degrees.

501.4 Concealed Piping

Cleanouts on concealed piping shall be extended through and terminate flush with the finished wall or floor; or pits or chases may be left in the wall or floor, provided they are of sufficient size to permit removal of the cleanout plug and proper cleaning of the system.

501.5 Base of Stacks

A cleanout shall be provided at or near the foot of each vertical waste or soil stack.

501.6 Inaccessible Stack Cleanouts

For buildings with a floor slab, or with less than 18-inch crawl space under the floor or where a stack cleanout is not easily accessible, the following shall be provided in lieu of a cleanout at the base of the stack. The building drain shall be extended to the outside of the building and terminated in an accessible cleanout or an accessible cleanout may be installed in the building drain downstream from the stack not more than 5 feet outside the building wall.

501.7 Building Drain and Building Sewer Junction

There shall be a cleanout near the junction of the building drain and building sewer. This cleanout may be either inside or outside the building wall provided it is brought up to finish grade or to the basement floor level.

501.8 Direction of Flow

Every cleanout shall be installed so that the cleanout opens in the direction of the flow of the drainage line or at right angles thereto.

501.9 Cleanout Size

Cleanouts shall be of the same nominal size as the pipes up to 4 inches and not less than 4 inches for larger piping.

501.10 Manholes for Large Pipes

For underground piping over 10 inches in diameter, manholes shall be provided and located at every change of major direction, grade, elevation or size of pipe or at intervals of not more than 400 feet. Metal covers shall be provided for the manholes and shall be of sufficient weight to meet local traffic and loading conditions.

501.11 Cleanout Clearances

- a. Large Pipe—18 Inch Clearance: Cleanouts on 3-inch or larger pipes shall be so installed that there is a clearance of not less than 18 inches for the purpose of rodding.
- b. Small Pipe—12 Inch Clearance: Cleanouts smaller than 3 inches shall be so installed that there is a 12-inch clearance for rodding.

501.12 Cleanouts To Be Kept Uncovered

Cleanout plugs shall not be covered with cement, plaster, or any other permanent finishing material. Where it is necessary to conceal a cleanout plug, a covering plate or access door shall be provided which will permit ready access to the plug.

501.13 Cleanout Equivalent

A fixture trap or a fixture with integral trap, readily removable without disturbing concealed roughing work, may be accepted as a cleanout equivalent, if there is no more than one 90 degree bend or sanitary tee on the line to be rodded.

501.14 Connections to Cleanouts Prohibited

Cleanout openings shall not be used for the installation of new fixtures or floor drains except where approved in writing by the Administrative Authority and where another cleanout of equal access and capacity is provided.

CHAPTER VI

Interceptors, Separators, and Backwater Valves

600. INTERCEPTORS AND SEPARATORS

600.1 *Interceptors Required*

Interceptors for oil, grease, sand, and other substance harmful or hazardous to the building drainage system, the public sewer, or sewage treatment plant or processes shall be provided as required by the Administrative Authority and as stated elsewhere in this Chapter.

600.1.1 *Interceptors Not Required*

A grease interceptor is not required for individual dwelling units or any private living quarters.

600.2 *Separators Required*

At commercial storage or repair garages; gasoline stations with grease racks, grease pits, or work racks; auto laundries; and at factories where oily and/or flammable liquid wastes are produced, separators shall be installed into which all oil bearing, grease bearing, and/or flammable wastes shall be discharged before emptying into the building drainage system or other point of disposal.

600.3 *Approval of Interceptors and Separators*

600.3.1 *Size, Type and Location To Be Approved*

The size, type, and location of each interceptor, and of each separator shall be approved by the Administrative Authority and no wastes other than those requiring treatment or separation shall be discharged into any interceptor or separator.

600.3.2 *Grease Interceptors To Be Tested and Rated*

No grease interceptor shall be approved until it has successfully passed the testing and rating procedure set up by the Administrative Authority.

600.3.3 *All Interceptors to Follow Type Approved*

No grease interceptor shall be hereinafter installed which does not comply, in all respects with the type or model of each size thereof approved by the Administrative Authority.

600.3.4 *Efficiency of Interceptors*

Interceptors shall be rated and approved for their efficiency as directed by the Administrative Authority and in accordance with generally accepted practice.

600.3.5 *Drawings of Special Type Separators*

Before installing any special type separator a drawing including all pertinent information shall be submitted for approval to the Administrative Authority.

600.4 *Grease Interceptors*

600.4.1 *Commercial Buildings*

A grease interceptor shall be installed in the waste line leading from sinks, drains, or other fixtures in the following establishments when, in the opinion of the Administrative Authority, a hazard exists: restaurants, hotel kitchens, bars, factory cafeterias or restaurants, clubs, or other establishments where grease can be introduced into the drainage system in quantities that can cause line stoppage or hinder sewage disposal.

Food waste grinders shall not discharge to the building drainage system through a grease interceptor.

600.4.2 Grease Interceptors Capacity

Grease interceptors, if installed, shall have the grease retention capacity indicated in Table 600.4.2, Capacity of Grease Interceptors, for the flow-through rates indicated.

TABLE 600.4.2.—Capacity of grease interceptors

Total flow-through rating in GPM	Grease retention capacity in lbs.
4	8
6	12
7	14
9	18
10	20
12	24
14	28
15	30
18	36
20	40
25	50
35	70
50	100

600.4.3 Rate of Flow Controls

Grease interceptors shall be equipped with devices to control the rate of water flow through the interceptors so that it does not exceed the rated flow of the interceptors.

600.5 Oil and Flammable Liquids Separator

600.5.1 Separation of Liquids

A mixture of light and heavy liquids having various specific gravities may be treated and then separated in a receptacle as approved by the Administrative Authority.

600.5.2 Design of Separators

- a. Overall Requirements: Oil separators shall have a depth of not less than 2 feet below the invert of the discharge drain. The outlet opening of the separator shall have not less than an 18-inch water seal.
- b. Motor Vehicle Garages: On each floor of garages where not more than three motor vehicles are serviced and stored, separators shall have a minimum capacity of 6 cubic feet and 1 cubic foot capacity shall be added for each vehicle up to 10 vehicles. Above 10 vehicles the Administrative Authority shall determine the size of the separator required.
- c. Service Stations and Repair Shops: Where vehicles are serviced only and not stored, separator capacity shall be based on a net capacity of 1 cubic foot for each 100 square feet of surface to be drained into the separator with a minimum of 6 cubic feet.

600.6 Interceptors and Separators for Specific Installations

600.6.1 Sand Interceptors—Commercial Establishments

Sand and similar interceptors for heavy solids shall be so designed and located as to be readily accessible for cleaning, and shall have a water seal of not less than 6 inches.

600.6.2 Laundries

Commercial laundries shall be equipped with an interceptor having a wire basket or similar device, removable for cleaning, that will prevent passage into the drainage system of solids $\frac{1}{2}$ inch or larger in size, string, rags, buttons, or other materials detrimental to the public sewerage system.

600.6.3 Bottling Establishments

Bottling plants shall discharge their process wastes into an interceptor which will provide for the separation of broken glass or other solids, before discharging liquid wastes into the drainage system.

600.6.4 Slaughter Houses

Slaughtering room and dressing room drains shall be equipped with separators or interceptors approved by the Administrative Authority which shall prevent the discharge into the drainage system of feathers, entrails, and other materials likely to clog the drainage system.

600.7 Venting of Interceptors and Separators

Interceptors and separators shall be so designed that they will not become air bound if closed covers are used. Each interceptor or separator shall be properly vented.

600.8 Interceptors and Separators To Be Accessible

Each interceptor and separator shall be so installed that it is readily accessible for removal of cover, servicing and maintenance. Need for use of ladders or moving of bulky objects in order to service interceptors shall constitute a violation of accessibility.

600.9 Maintenance of Interceptors and Separators

Interceptors and separators shall be maintained in efficient operating condition by periodic removal of accumulated grease, scum, oil, or other floating substances, and solids deposited in the interceptor or separator.

601. BACKWATER VALVES

601.1 Fixtures Subject to Backflow

The installation of backwater devices shall be in accordance with lawful requirements of the Administrative Authority.

601.2 Fixture Branches Below Grade

Backwater valves shall be installed in the building drain branch which receives only the discharge from fixtures connected to branches which are located below grade.

601.3 Materials for Backwater Valves

Backwater valves shall have all bearing parts of corrosion-resistant material.

601.4 Construction of Backwater Valves

Backwater valves shall be constructed so a mechanical seal against backflow will be provided.

601.5 Diameter of Backwater Valves

Backwater valves, when fully opened shall have a capacity not less than that of the pipes in which they are installed.

601.6 Location of Backwater Valves

Backwater valves shall be installed so their working parts will be readily accessible for service and repairs.

CHAPTER VII

Plumbing Fixtures

700. CONNECTIONS TO PLUMBING SYSTEM REQUIRED

All plumbing fixtures and drains used to receive or discharge liquid wastes or sewage shall be connected to the drainage system of the building or premises in accordance with the requirements of this Code.

701. MINIMUM PLUMBING FACILITIES

701.1 *Minimum Number of Fixtures*

Plumbing fixtures shall be provided for the type of building occupancy and in the minimum number(s) shown in Table 701.1, Minimum Number of Plumbing Fixtures. Types of building occupancy not shown in Table 701.1 will be considered individually by the Administrative Authority.

701.2 *Separate Facilities*

In other than residential installations where toilet and bathing facilities are provided to serve members of both sexes and are designed for use by more than one person at a time, separate facilities shall be installed for each sex.

702. INSTALLATION OF FIXTURES

702.1 *Access for Cleaning*

Plumbing fixtures shall be so installed as to afford easy access for cleaning both the fixture and the area about it. Where practical, all pipes from fixtures shall be run to the nearest wall.

702.2 *Convenient and Accessible*

Fixtures shall be set level and in proper alignment with reference to adjacent walls. No water closet shall be set closer than fifteen (15) inches from its center to any side wall or partition nor closer than thirty (30) inches, center to center, between toilets. No urinal shall be set closer than fifteen (15) inches from its center to any side wall or partition nor closer than twenty-four (24) inches, center to center, between urinals.

TABLE 701.1.—Minimum number of plumbing fixtures

Type of building occupancy	Type of fixture					
	Water closets	Urinals	Lavatories	Bathubs or showers	Drinking fountains	Other fixtures
Assembly—places of worship.	Number of persons 150 Women..... 1 300 Men..... 1	Number of persons 300 Men..... 1	1.....	1.....	1.....	
	Number of persons 1-100..... 1 101-200..... 2 201-400..... 3 Over 400, add 1 fixture for each additional 500 men and 1 for each 300 women.	Number of persons 1-200..... 1 201-400..... 2 401-600..... 3 Over 600, add 1 fixture for each 300 men. ^a	Number of persons 1-200..... 1 201-400..... 2 401-750..... 3 Over 750, add 1 fixture for each 500 persons.		1 for each 300 persons.	1 slop sink.
Dormitories—school or other, also institutional.	Men: 1 for each 10 persons. Women: 1 for each 8 persons.	1 for each 25 men. Over 150, add 1 fixture for each 50 men. ^a	1 for each 12 persons. (Separate dental lavatories should be provided in community toilet rooms. A ratio of 1 dental lavatory to each 50 persons is recommended.)	1 for each 8 persons. For women's dormitories, additional bathtubs should be installed at the ratio of 1 for each 30 women. Over 180 persons add 1 fixture for each 20 persons.	1 for each 75 persons.	Laundry trays, 1 for each 50 persons. Slop sinks, 1 for each 100 persons.
Dwellings—one and two family.	1 for each dwelling unit.		1 for each dwelling unit.	1 for each dwelling unit.		Kitchen sink 1 for each dwelling unit.
Dwellings—multiple or apartment.	1 for each dwelling unit or apartment.		1 for each dwelling unit or apartment.	1 for each dwelling unit or apartment.		Kitchen sink 1 for each dwelling unit or apartment. For each dwelling unit, 1 double laundry tray for each 10 units or 1 automatic laundry machine for each 20 units.

Industrial—factories, warehouses, foundries, and similar establishments.	Number of persons		Where more than 10 persons are employed: Number of men	Number of fixtures	Number of persons	Number of fixtures	1 shower for each 15 persons exposed to excessive heat or to occupational hazard from poisonous, infectious or irritating material.	1 for each 75 persons.
	each sex	Number of fixtures			persons	Number of fixtures		
	1-10.....	1	1	1	1-10.....	1		
	11-25.....	2	2	2	11-25.....	2		
	26-50.....	3	3	3	26-50.....	3		
	51-75.....	4	4	4	76-100.....	5		
	76-100.....	5	5	5	101-150.....	6		
	101-150.....	6	6	6	151-200.....	7		
	201-250.....	7	7	7	251-300.....	8		
	301-350.....	8	8	8	351-400.....	9		
	401-450.....	9	9	9	451-500.....	10		
	501-550.....	10	10	10	551-600.....	11		
	601-650.....	11	11	11	651-700.....	12		
	701-750.....	12	12	12	751-800.....	13		
	801-850.....	13	13	13	851-900.....	14		
	901-950.....	14	14	14	951-1000.....	15		
	1001-1050.....	15	15	15	1051-1100.....	16		
	1101-1150.....	16	16	16	1151-1200.....	17		
	1201-1250.....	17	17	17	1251-1300.....	18		
	1301-1350.....	18	18	18	1351-1400.....	19		
	1401-1450.....	19	19	19	1451-1500.....	20		
	1501-1550.....	20	20	20	1551-1600.....	21		
	1601-1650.....	21	21	21	1651-1700.....	22		
	1701-1750.....	22	22	22	1751-1800.....	23		
	1801-1850.....	23	23	23	1851-1900.....	24		
	1901-1950.....	24	24	24	1951-2000.....	25		
	2001-2050.....	25	25	25	2051-2100.....	26		
	2101-2150.....	26	26	26	2151-2200.....	27		
	2201-2250.....	27	27	27	2251-2300.....	28		
	2301-2350.....	28	28	28	2351-2400.....	29		
	2401-2450.....	29	29	29	2451-2500.....	30		
	2501-2550.....	30	30	30	2551-2600.....	31		
	2601-2650.....	31	31	31	2651-2700.....	32		
	2701-2750.....	32	32	32	2751-2800.....	33		
	2801-2850.....	33	33	33	2851-2900.....	34		
	2901-2950.....	34	34	34	2951-3000.....	35		
	3001-3050.....	35	35	35	3051-3100.....	36		
	3101-3150.....	36	36	36	3151-3200.....	37		
	3201-3250.....	37	37	37	3251-3300.....	38		
	3301-3350.....	38	38	38	3351-3400.....	39		
	3401-3450.....	39	39	39	3451-3500.....	40		
	3501-3550.....	40	40	40	3551-3600.....	41		
	3601-3650.....	41	41	41	3651-3700.....	42		
	3701-3750.....	42	42	42	3751-3800.....	43		
	3801-3850.....	43	43	43	3851-3900.....	44		
	3901-3950.....	44	44	44	3951-4000.....	45		
	4001-4050.....	45	45	45	4051-4100.....	46		
	4101-4150.....	46	46	46	4151-4200.....	47		
	4201-4250.....	47	47	47	4251-4300.....	48		
	4301-4350.....	48	48	48	4351-4400.....	49		
	4401-4450.....	49	49	49	4451-4500.....	50		
	4501-4550.....	50	50	50	4551-4600.....	51		
	4601-4650.....	51	51	51	4651-4700.....	52		
	4701-4750.....	52	52	52	4751-4800.....	53		
	4801-4850.....	53	53	53	4851-4900.....	54		
	4901-4950.....	54	54	54	4951-5000.....	55		
	5001-5050.....	55	55	55	5051-5100.....	56		
	5101-5150.....	56	56	56	5151-5200.....	57		
	5201-5250.....	57	57	57	5251-5300.....	58		
	5301-5350.....	58	58	58	5351-5400.....	59		
	5401-5450.....	59	59	59	5451-5500.....	60		
	5501-5550.....	60	60	60	5551-5600.....	61		
	5601-5650.....	61	61	61	5651-5700.....	62		
	5701-5750.....	62	62	62	5751-5800.....	63		
	5801-5850.....	63	63	63	5851-5900.....	64		
	5901-5950.....	64	64	64	5951-6000.....	65		
	6001-6050.....	65	65	65	6051-6100.....	66		
	6101-6150.....	66	66	66	6151-6200.....	67		
	6201-6250.....	67	67	67	6251-6300.....	68		
	6301-6350.....	68	68	68	6351-6400.....	69		
	6401-6450.....	69	69	69	6451-6500.....	70		
	6501-6550.....	70	70	70	6551-6600.....	71		
	6601-6650.....	71	71	71	6651-6700.....	72		
	6701-6750.....	72	72	72	6751-6800.....	73		
	6801-6850.....	73	73	73	6851-6900.....	74		
	6901-6950.....	74	74	74	6951-7000.....	75		
	7001-7050.....	75	75	75	7051-7100.....	76		
	7101-7150.....	76	76	76	7151-7200.....	77		
	7201-7250.....	77	77	77	7251-7300.....	78		
	7301-7350.....	78	78	78	7351-7400.....	79		
	7401-7450.....	79	79	79	7451-7500.....	80		
	7501-7550.....	80	80	80	7551-7600.....	81		
	7601-7650.....	81	81	81	7651-7700.....	82		
	7701-7750.....	82	82	82	7751-7800.....	83		
	7801-7850.....	83	83	83	7851-7900.....	84		
	7901-7950.....	84	84	84	7951-8000.....	85		
	8001-8050.....	85	85	85	8051-8100.....	86		
	8101-8150.....	86	86	86	8151-8200.....	87		
	8201-8250.....	87	87	87	8251-8300.....	88		
	8301-8350.....	88	88	88	8351-8400.....	89		
	8401-8450.....	89	89	89	8451-8500.....	90		
	8501-8550.....	90	90	90	8551-8600.....	91		
	8601-8650.....	91	91	91	8651-8700.....	92		
	8701-8750.....	92	92	92	8751-8800.....	93		
	8801-8850.....	93	93	93	8851-8900.....	94		
	8901-8950.....	94	94	94	8951-9000.....	95		
	9001-9050.....	95	95	95	9051-9100.....	96		
	9101-9150.....	96	96	96	9151-9200.....	97		
	9201-9250.....	97	97	97	9251-9300.....	98		
	9301-9350.....	98	98	98	9351-9400.....	99		
	9401-9450.....	99	99	99	9451-9500.....	100		
	9501-9550.....	100	100	100	9551-9600.....	101		
	9601-9650.....	101	101	101	9651-9700.....	102		
	9701-9750.....	102	102	102	9751-9800.....	103		
	9801-9850.....	103	103	103	9851-9900.....	104		
	9901-9950.....	104	104	104	9951-10000.....	105		
	10001-10050.....	105	105	105	10051-10100.....	106		
	10101-10150.....	106	106	106	10151-10200.....	107		
	10201-10250.....	107	107	107	10251-10300.....	108		
	10301-10350.....	108	108	108	10351-10400.....	109		
	10401-10450.....	109	109	109	10451-10500.....	110		
	10501-10550.....	110	110	110	10551-10600.....	111		
	10601-10650.....	111	111	111	10651-10700.....	112		
	10701-10750.....	112	112	112	10751-10800.....	113		
	10801-10850.....	113	113	113	10851-10900.....	114		
	10901-10950.....	114	114	114	10951-11000.....	115		
	11001-11050.....	115	115	115	11051-11100.....	116		
	11101-11150.....	116	116	116	11151-11200.....	117		
	11201-11250.....	117	117	117	11251-11300.....	118		
	11301-11350.....	118	118	118	11351-11400.....	119		
	11401-11450.....	119	119	119	11451-11500.....	120		
	11501-11550.....	120	120	120	11551-11600.....	121		
	11601-11650.....	121	121	121	11651-11700.....	122		
	11701-11750.....	122	122	122	11751-11800.....	123		
	11801-11850.....	123	123	123	11851-11900.....	124		
	11901-11950.....	124	124	124	11951-12000.....	125		
	12001-12050.....	125	125	125	12051-12100.....	126		
	12101-12150.....	126	126	126	12151-12200.....	127		
	12201-12250.....	127	127	127	12251-12300.....	128		
	12301-12350.....	128	128	128	12351-12400.....	129		
	12401-12450.....	129	129	129	12451-12500.....	130		
	12501-12550.....	130	130	130	12551-12600.....	131		
	12601-12650.....	131	131	131	12651-12700.....	132		
	12701-12750.....	132	132	132	12751-12800.....	133		
	12801-12850.....	133	133	133	12851-12900.....	134		
	12901-12950.....	134	134	134	12951-13000.....	135		
	13001-13050.....	135	135	135	13051-13100.....	136		
	13101-13150.....	136	136	136	13151-13200.....	137		
	13201-13250.....	137	137	137	13251-13300.....	138		
	13301-13350.....	138	138	138	13351-13400.....	139		
	13401-13450.....	139	139	139	13451-13500.....	140		
	13501-13550.....	140	140	140	13551-13600.....	141		
	13601-13650.....	141	141	141	13651-13700.....	142		
	13701-13750.....	142	142	142	13751-13800.....	143		
	13801-13850.....	143	143	143	13851-13900.....	144		
	13901-13950.....	144	144	144	13951-14000.....	145		
	14001-14050.....	145	145	145	14051-14100.....	146		
	14101-14150.....	146	146	146	14151-14200.....	147		
	14201-14250.....	147	147	147	14251-14300.....	148		
	14301-14350.....	148	148	148	14351-14400.....	149		
	14401-14450.....	149	149	149	14451-14500.....	150		
	14501-14550.....	150	150	150	14551-14600.....	151		
	14601-14650.....	151	151	151	14651-14700.....	152		
	14701-14750.....	152	152	152	14751-14800.....	153		
	14801-14850.....	153	153	153	14851-14900.....	154		
	14901-14950.....	154	154	154	14951-15000.....	155		
	15001-15050.....	155	155	155	15051-151			

702.3 Securing Floor-Outlet Fixtures

Floor-outlet fixtures shall be rigidly secured to floor or floor flanges by screws or bolts.

702.4 Water-Tight Joints

Joints formed where fixtures come in contact with walls or floors shall be sealed.

702.5 Securing Wall-Hung Bowls

Wall-hung water closet bowls shall be rigidly supported by a concealed metal hanger which is attached to building structural members so that no strain is transmitted to the closet connector or any other part of the plumbing system.

702.6 Water Supply Protection

The supply lines or fittings for every plumbing fixture shall be so installed as to prevent backflow.

702.7 Overflows

702.7.1 Design of Overflows

In any fixture which is provided with an overflow, the waste shall be designed and installed so that the standing water in the fixture cannot rise in the overflow when the stopper is closed, nor shall any water remain in the overflow when the fixture is empty.

702.7.2 Connection of Overflows

The overflow from any fixture shall discharge into the drainage system on the inlet or fixture side of the trap, provided that the overflow from a flush tank serving a water closet or urinal shall discharge into the fixture served.

702.8 Access to Concealed Connections

Fixtures having concealed slip joint connections shall be provided with an access panel or utility space or other convenient access so arranged as to make the slip connections accessible for inspection and repair. However, where such access cannot be provided, access doors may be eliminated, but all joints must be soldered or screwed, so as to form a solid connection.

702.9 Fixtures to Have Strainers

All plumbing fixtures other than water closets, clinic sinks, trap standard slop sinks with flush rims, and siphon-action washdown or blowout urinals, shall be provided with metal strainers having a waterway area complying with good principles of hydraulics.

703. WATER CLOSETS

703.1 Prohibited Water Closets

Pan, valve, plunger, offset, latrine, frostproof, and side or rear spud water closets shall be prohibited. Water closets which have an invisible seal, and unventilated space, or walls which are not thoroughly washed at each discharge, shall be prohibited. Any water closet which might permit siphonage of the contents of the bowl back into the flush tank shall be prohibited.

703.2 Water Closets for Public Use

Water closet bowls for public use shall be of the elongated type.

703.3 Water Closets for Children's Use

In nurseries, schools, and other similar places where plumbing fixtures are provided for the use of children under 6 years of age, water closets shall be of small size and height suitable for the children's use.

703.4 Water Closet Seats

Water closets shall be equipped with seats of smooth nonabsorbent material. All seats of water closets provided for public use shall be of the open-front type. Integral water closet seats shall be of the same material as the fixture.

703.5 Water Closet Connections

703.5.1 Lead Connections

Three-inch lead bends and stubs may be used on water closets or similar connections provided the inlet is dressed or swedged to receive a 4-inch floor flange.

703.5.2 Iron Connections

Three-inch bends may be used on water closets or similar connections, provided a 4-inch x 3-inch flange is used to receive the fixture horn.

703.5.3 Copper Connections

Three-inch bends may be used on water closets or similar connections provided a 4-inch x 3-inch flange is used to receive a fixture horn.

703.5.4 Reducing Bends

Four- by 3-inch bends are acceptable.

704. URINALS

704.1 Prohibited Urinals

Floor-type trough urinals are prohibited.

704.2 Wall-Hung Trough Urinals

Wall-hung trough urinals shall be permitted only in temporary locations. They shall be not less than 6 inches deep and shall be furnished with one-piece backs and have strainers with outlets at least 1½ inches in diameter. The washdown pipe shall be perforated so as to flush with an even curtain of water against the back of the urinal. This pipe shall be securely clamped as high as practicable to the back of the urinal. Trough urinals shall have tanks with a flushing capacity of not less than 1½ gallons of water for each 2 feet of urinal length.

704.2.1 Equivalent Length

Trough urinal shall be figured on the basis of one urinal for each 18 inches of length, i.e.

- 24 in. trough equals 1 urinal
- 36 in. trough equals 2 urinals
- 48 in. trough equals 2 urinals
- 60 in. trough equals 3 urinals
- 72 in. trough equals 4 urinals

704.3 Surrounding Material

Wall and floor space to a point 1 foot in front of a urinal lip and 4 feet above the floor, and at least 1 foot to each side of the urinal shall be waterproofed with a smooth, readily cleanable, nonabsorbent material.

705. FLUSHING DEVICES FOR WATER CLOSETS AND URINALS

705.1 Flushing Devices Required

Each water closet, urinal, clinical sink, or other plumbing fixture which depends on trap siphonage to discharge its waste contents to the drainage system to which it is connected, shall be provided with a flushometer valve, flush tank, or similar device designed and installed so as to supply water in sufficient quantity and rate of flow to flush to the sewer the contents of the fixture to which it is connected to cleanse the fixture and refill the fixture trap.

705.1.1 Separate for Each Fixture

A flushing device shall serve only one fixture except that when otherwise approved by the Administrative Authority, a single flush tank may be used to flush more than one urinal provided that the flushing cycle is controlled automatically and that each urinal or section thereof is thoroughly flushed.

705.2 Flushometer Valves

Flushometers shall be installed so that they will be readily accessible for repair. Flushometer valves shall not be used where the water pressure is insufficient to properly operate them. When the valve is operated, it shall complete the cycle of operation automatically, opening fully and closing positively under the water line pressure. Each flushometer shall be provided with a means for regulating the flow through it.

705.3 Flush Tanks

705.3.1 Water Supply for Flush Tanks

An adequate quantity of water shall be provided to flush and clean the fixture served. The water supply to flush tanks equipped for manual flushing shall be controlled by a float valve or other automatic device designed to refill the tank after each discharge and to completely shut off the water flow to the tank when the tank is filled to operational capacity. The water supply piping shall be so arranged that it cannot be submerged or come in contact with the water in the flush tank. Provision shall be made to automatically supply water to the fixture so as to refill the trap seal after each flushing. The water supply to flush tanks equipped for automatic flushing shall be controlled by a suitable timing device.

705.3.2 Flush Valves in Flush Tanks

Flush valve seats in tanks for flushing water closets shall be at least 1 inch above the flood level rim of the bowl connected thereto, except in approved water closet and flush tank combinations designed so that when the tank is flushed and the fixture is clogged or partially clogged, the flush valve will close tightly so that water will not spill continuously over the rim of the bowl or backflow from the bowl to the tank.

705.3.3 Overflows in Flush Tanks

Flush tanks shall be provided with overflows discharging to the water closet or urinal connected thereto and of sufficient size to prevent flooding the tank at the maximum rate at which the tanks are supplied with water.

Where float valves in flush tanks are beneath the rim of the tank, there shall be provided an emergency overflow in the wall of the tank in addition to the internal overflow so as to prevent the water level in the tank from reaching the air inlets of the float valve should the internal overflow become plugged.

706. LAVATORIES

706.1 Lavatory Waste Outlets

Lavatories shall have waste outlets not less than 1½ inches in diameter. A strainer, pop-up stopper, crossbars or other device shall be provided to restrict the clear opening of the waste outlet.

706.2 Multiple Type Fixture

Each 18-inch unit of usable length or circumference of a straight-line or circular multiple use lavatory shall be considered equivalent to one lavatory as it affects the drainage and water supply piping sizes and fixture usage requirements; provided hot and cold or tempered water suitable for hand-washing is available for each 18-inch interval.

707. BATHTUBS

707.1 Bathtub Waste Outlets and Overflows

Bathtubs shall have waste outlets and overflows at least 1½ inches in diameter and the waste outlet shall be equipped with a suitable stopper.

708. SHOWERS

708.1 Water Supply Riser

Every water supply riser from the shower valve to the shower head outlet, whether exposed or not, shall be securely attached to the structure.

708.2 Shower Waste Outlet

Waste outlets, other than those in bathtubs, serving showers shall be at least 1½ inches in diameter and have removable strainers not less than three inches in diameter having strainer openings not less than ¼ inch in minimum dimension. Where each shower space is not provided with an individual waste outlet, the waste outlet must be so located and the floor so pitched that waste water from one shower does not flow over the floor area serving another shower. Waste outlets shall be securely fastened to the waste pipe making a water-tight connection thereto.

708.3 Shower Compartments

Shower compartments shall have at least 1,024 square inches of floor area and be not less than 30 inches in minimum dimension measured from its finished interior dimension as the side of a rectangle, altitude of a triangle or diameter of a circle or other angular shape. The wall area above built-in tubs having installed shower heads and in shower compartments shall be constructed of smooth, noncorrosive, and nonabsorbent, waterproof materials to a height not less than 6 feet above the floor level. Such walls shall form a watertight joint with each other and with either the tub, receptor, or shower floor.

708.4 Shower Floors or Receptors

Floors or receptors under shower compartments shall be laid on or be supported by a smooth and structurally sound base. Floors under shower compartments, other than those laid directly on the ground surface or where prefabricated receptors have been provided, shall be lined and made watertight by the provision of suitable shower pans of durable material. Such pans shall turn up on all sides at least 2 inches above the finished threshold level. Pans shall be securely fastened to the waste outlet at the seepage entrance making a watertight joint between the pan and the outlet. Floor surfaces shall be constructed of smooth, noncorrosive, nonabsorbent, and waterproof materials.

709. SINKS

709.1 Sink Waste Outlets

Sinks shall be provided with waste outlets not less than 1½ inches in diameter. A strainer, crossbar, or other device shall be provided to restrict the clear opening of the waste outlet. Sinks on which a food grinder is installed shall have a waste opening not less than 2½ inches in diameter.

710. FOOD-WASTE-GRINDER UNITS

710.1 Domestic Food-Waste-Grinder Waste Outlets

Domestic food-waste-grinders shall be connected to a drain of not less than 1½ inches in diameter.

710.2 Commercial Food-Waste-Grinder Waste Outlets

Commercial food-waste-grinders shall be connected to a drain of sufficient size to serve the unit, but in no case connected to a drain of less than 2 inches in diameter. Commercial food-waste-grinders shall be connected and trapped separately from any other fixtures or compartments.

710.3 Water Supply Required

All food-waste-grinders shall be provided with an adequate supply of water in sufficient flow rate to insure proper functioning of the unit.

710.4 Grinders Not To Be Connected With Grease Interceptors

No food-waste-grinders shall be connected so as to discharge through a grease interceptor.

711. DISHWASHING MACHINES

Water shall be supplied to all dishwashing machines and the water lines shall be protected against backflow by an air gap or backflow preventer. Dishwashers shall discharge separately through an air gap or air break into a trap or trapped fixture which is properly vented. A commercial dishwasher located above a floor drain may discharge waste directly through a connection on the sewer side and immediately adjacent to the floor-drain trap, provided that the drain line from the machine is properly trapped and vented.

712. AUTOMATIC CLOTHES WASHERS

A water supply line to an automatic clothes washer shall be protected against backflow by the use of an air gap or backflow preventer. The discharge from such a machine shall be through an air break.

713. LAUNDRY TRAYS

713.1 Laundry Tray Waste Outlet

Each compartment of a laundry tray shall be provided with a waste outlet not less than 1½ inches in diameter and a strainer or crossbar to restrict the clear opening of the waste outlet.

714. GARBAGE CAN WASHERS

Garbage can washers shall be separately trapped and shall discharge through a grease interceptor. The receptacle receiving the wash from garbage cans shall be provided with a removable basket or strainer to prevent discharge of large particles into the building drainage system. Any water supply connection shall be protected against backflow by an air gap or a backflow prevention device.

715. SPECIAL PLUMBING FIXTURES

715.1 Water Connections

Baptisteries, ornamental and lily pools, aquaria, ornamental fountain basins, swimming pools, and similar constructions when provided with water supplies shall be protected from backsiphonage as required in Chapter 10.

715.2 Approval

Specialties requiring water and waste connections shall be submitted for approval of the Administrative Authority.

716. FLOOR DRAINS

716.1 Floor Drain Trap and Strainer

Floor drains shall have integral traps having a minimum water seal of three inches and shall be provided with removable strainers. The floor drain shall be so constructed that it can be readily cleaned, and the drain inlet shall be easily accessible at all times. Floor drains subject to backflow shall be provided with a backwater valve.

716.2 Size of Floor Drains

Floor drains shall be of a size to serve efficiently the purpose for which they are intended, but the outlet pipe shall not be less than 2 inches in nominal diameter.

716.3 Provision for Evaporation

Where floor drains are subject to evaporation, they shall be of the deep seal type and shall be provided with a water supply, through an air gap, from a plumbing fixture, approved automatic priming device or other approved means.

CHAPTER VIII

Hangers and Supports

800. MATERIAL

Hangers, anchors, and supports shall be of metal or other material of sufficient strength to support the piping and its contents except that piers may be of concrete, brick, or other approved material.

801. ATTACHMENT TO BUILDING

Hangers and anchors shall be securely attached to the building construction at sufficiently close intervals to support the piping and its contents.

802. INTERVALS OF SUPPORT

802.1 Vertical Piping

Vertical pipe of the following materials shall be supported at not more than the distance intervals shown.

- a. Cast iron soil pipe—at base and at each story height.
- b. Threaded pipe (SPS)—every other story height.
- c. Copper tubing—at each story height but not more than 10-foot intervals.
- d. Lead pipe—4-foot intervals.
- e. Plastic pipe—4-foot intervals.

802.2 Horizontal Piping

Horizontal pipe of the following materials shall be supported at not more than the distance intervals shown.

- a. Cast iron soil pipe—5-foot intervals except that where 10-foot lengths of cast iron soil pipe are used, 10-foot intervals between supports are acceptable.
- b. Threaded pipe—12-foot intervals.
- c. Copper tubing (1½ inch or less)—6-foot intervals.
- d. Copper tubing (1½ inch or over)—10-foot intervals.
- e. Lead pipe—on continuous metal or wood strips for its entire length.
- f. Plastic pipe—on continuous metal or wood strips for its entire length.

803. BASE OF STACKS

Bases of cast-iron stacks shall be supported on concrete, brick laid in cement mortar, metal brackets attached to the building construction, or by other methods approved by the Administrative Authority. Other piping material shall be so anchored as to take the load off the stack at the base.

CHAPTER IX

Indirect Waste Piping and Special Waste

900. INDIRECT WASTES

900.1 *Indirect Wastes Required*

900.1.1 *Food Handling Establishments*

In the case of food handling establishments engaged in the storage, preparation, selling, serving, processing, or otherwise handling food, indirect waste piping shall be provided for refrigerators, refrigerator coils, walk-in freezers, ice boxes, ice making machines, steam kettles, steam tables, potato peelers, egg boilers, coffee urns, and similar types of enclosed equipment. Dishwashing sink and open culinary sinks are excluded from this requirement. The indirect waste shall discharge through an air gap or air break into a trapped and vented receptor except that an air gap is required where the indirect waste pipe may be under vacuum (less than atmospheric pressure).

900.1.2 *Connections From Water Distribution System*

Indirect waste connections shall be provided for drains, overflows, or relief vents from the water distribution system by means of an air gap.

900.1.3 *Sterilizers*

Appliances, devices, or apparatus such as stills, sterilizers and similar equipment requiring waste connections and used for sterile materials shall be indirectly connected by means of an air gap.

900.1.4 *Drips or Drainage Outlets*

Appliances, devices, or apparatus not regularly classed as plumbing fixtures but which have drips or drainage outlets, may be drained by indirect waste pipes discharging into an open receptacle through either an air gap or air break as shall be determined by the Administrative Authority.

900.1.5 *Clear Water Wastes*

Water lifts, expansion tanks, cooling jackets, sprinkler systems, drip or overflow pans, or similar devices which waste clear water only, when emptying into the building drainage system, shall discharge through an indirect waste by means of an air gap.

900.1.6 *Swimming Pools*

Pipes carrying waste water from swimming or wading pools including pool drainage, back wash from filters, water from scum gutter drains or floor drains which serve walks around pools, shall be installed as an indirect waste. Circulation pumps may be utilized to lift waste water when the indirect waste line is below the sewer grade. The indirect waste shall discharge into the drainage system through an air gap.

900.1.7 *Pressure Tanks, Boilers and Relief Valves*

The drains from pressure tanks, boilers, relief valves and similar equipment when connected to the drainage system shall discharge through an indirect waste by means of an air gap.

900.2 Air Gap or Air Break Required

All indirect waste piping shall discharge into the building drainage system through an air gap or air break, as set forth in Section 900.1 of this Code and in no instance shall the indirect waste be trapped ahead of the air gap or air break.

900.2.1 Methods of Providing an Air Gap

The air gap between the indirect waste and the building drainage system shall be at least twice the effective diameter of the drain served and shall be provided by one of the following methods:

- a. To a Receptor: Extend the indirect waste pipe to an open, accessible individual waste sink, floor drain, or other suitable fixture which is properly trapped and vented. The indirect waste shall terminate a sufficient distance above the flood level rim of the receiving fixture to provide the required air gap, and shall be installed in accordance with this Code.
- b. To the Inlet Side of a Trap: Provide an air gap in the drain connection on the inlet side of the trap which receives the waste from the indirect waste.

900.2.2 Methods of Providing an Air Break

When an air break is required between the indirect waste and the building drainage system, the distance to which the outlet of the indirect waste pipe extends below the flood level rim of the receptacle into which it is discharging shall be prescribed by the Administrative Authority.

900.3 Receptors or Sumps

900.3.1 Installation

Waste receptors or sumps serving indirect waste pipes shall not be installed in any toilet room, nor in any inaccessible or unventilated space such as a closet or storeroom.

900.3.2 Cleanout Location

If the indirect waste receptor is set below floor level, it shall be equipped with a running trap adjacent thereto with the trap cleanout brought level with the floor.

900.3.3 Strainers and Baskets

Every indirect waste receptor shall be equipped with a readily removable metal basket over which all indirect waste pipes shall discharge, or the indirect waste receptor outlet shall be equipped with a beehive strainer not less than 4 inches in height.

900.3.4 Splashing To Be Prevented

All plumbing receptors receiving the discharge of the indirect waste pipes, shall be of such shape and capacity as to prevent splashing or flooding.

900.3.5 Domestic or Culinary Fixtures Prohibited as Receptors

No plumbing fixture which is used for domestic or culinary purposes shall be used to receive the discharge of an indirect waste except that in a residence a kitchen sink is acceptable for use as a receptor for dishwashers and similarly a laundry tray as a receptor for a clothes washing machine.

900.3.6 Stand-Pipe Receptors

The stand-pipe receptor for an automatic clothes washer shall be installed in one of the following ways.

- a. The stand-pipe receptor shall be individually trapped and vented provided that the stand-pipe extends no more than 30-inches nor less than 18-inches above its trap and in no case shall the trap be installed below the floor.
- b. The stand-pipe receptor shall be installed in the cover of a floor drain provided the cover is trapped to receive the stand-pipe. The size of the floor drain shall depend on the discharge rate of the automatic clothes washer or the floor area to be drained, whichever is greater.

900.4 *Condenser Sumps*

No steam pipe shall connect to any part of a drainage or plumbing system, nor shall any water above 140° F. be discharged into any part of a drainage system. Such pipes shall be connected by discharging into an indirect waste receptor connected to the drainage system.

900.5 *Installation of Indirect Waste Piping*

Indirect waste piping shall be installed so as to permit ready access for flushing and cleaning and shall meet the material and pipe sizing requirements of this Code.

901. SPECIAL WASTES

901.1 *Neutralizing Device Required for Corrosive Wastes*

In no case shall corrosive liquids, spent acids, or other harmful chemicals which might destroy or injure a drain, sewer, soil or waste pipe, or which might create noxious or toxic fumes, or which interferes with sewage treatment processes, discharge into the plumbing system without being thoroughly diluted, neutralized, or treated by passing through a properly constructed and acceptable dilution or neutralizing device. Such devices shall be automatically provided with a sufficient intake of diluting water or neutralizing medium, so as to make its contents noninjurious before being discharged into the drainage system. Furthermore, the nature of the corrosive or harmful waste and method of its treatment or dilution shall be submitted to, and accepted by the Administrative Authority prior to installation.

CHAPTER X

Water Supply and Distribution

1000. WATER REQUIRED

1000.1 *Buildings*

Every building equipped with plumbing fixtures and used for human occupancy or habitation shall be provided with a potable supply of cold water in the amounts and at the pressures specified in this chapter. For permanent residences or buildings in which people are employed, hot water shall be provided.

1000.2 *Use of Non-Potable Water Prohibited*

Only potable water shall be accessible to plumbing fixtures supplying water for drinking, bathing, culinary use or the processing of food, medical or pharmaceutical products.

1001. WATER SERVICE

1001.1 *Size of Water Service*

The water service pipe shall be of sufficient size to furnish water to the building in the quantities and at the pressures required elsewhere in this Code. It shall, in no case, be less than $\frac{3}{4}$ inch nominal diameter. Methods for sizing the water service pipe are described in Appendix D.

1001.2 *Separation of Water Service and Building Sewer*

1001.2.1 *Distance Limits and Methods of Installing*

Except as permitted below, the underground water service pipe and the building drain or building sewer shall be not less than 10 feet apart horizontally and shall be separated by undisturbed or compacted earth.

The water service pipe may be placed in the same trench with the building drain and building sewer provided approval is given by the Administrative Authority and the following conditions are met:

- a. The bottom of the water service pipe, at all points, shall be at least 12 inches above the top of the sewer line at its highest point.
- b. The water service pipe shall be placed on a solid shelf excavated at one side of the common trench.
- c. The number of joints in the service pipe shall be kept to a minimum.
- d. The materials and joints of sewer and water service pipe shall be installed in such manner and shall possess the necessary strength and durability to prevent the escape of solids, liquids, and gases, therefrom, under all known adverse conditions such as corrosion, strains due to temperature changes, settlement, vibrations and superimposed loads.

1001.2.2 *Water Service Near Sources of Pollution*

Potable water service pipes shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits. A separation of 10 feet shall be maintained. Where the water service must cross the sewer line, the bottom of the water service within 10 feet of the point of crossing, shall be at least 12 inches above the top of the sewer line. The sewer line shall be of cast iron with leaded or mechanical joints at least 10 feet on either side of the crossing.

1001.3 Water Service Pipe Through Wall

Clearance shall be provided around a water service pipe passing through walls to protect it against (a) chemical action from direct contact with concrete, (b) distortion or rupture of water service pipe from shearing action due to settlement, (c) distortion or rupture of the water service pipe caused by expansion or contraction. Clearance shall be not less than one-half ($\frac{1}{2}$) inch between the outside of the pipe and the wall. Sleeves or arches may be used to provide the wall opening. The space between the pipe and wall structure shall be carefully packed or caulked with lead or water-proof and vermin and rodent resistant material.

1002. DESIGN OF BUILDING WATER DISTRIBUTION SYSTEM

The design of the building hot and cold water distribution system shall conform to good engineering practice. Methods used to determine pipe sizes shall be acceptable to the Administrative Authority. (A guide to the design of building water supply systems is given in Appendix D.)

1002.1 Size of Fixture Supply

The minimum sizes of a fixture supply pipe shall be as shown in Table 1002.1. Minimum Sizes of Fixture Supply Pipes. The fixture supply pipe shall be extended to within at least 30 inches of the point of connection to the fixture.

TABLE 1002.1.—Minimum sizes of fixture water supply lines

Type of fixture or device	Nominal pipe size (inches)	Type of fixture or device	Nominal pipe size (inches)
Bathtubs.....	$\frac{1}{2}$	Sinks (service, slop).....	$\frac{1}{2}$
Combination sink and tray.....	$\frac{1}{2}$	Sinks flushing rim.....	$\frac{3}{4}$
Drinking fountain.....	$\frac{3}{4}$	Urinal (flush tank).....	$\frac{1}{2}$
Dishwater (domestic).....	$\frac{1}{2}$	Urinal (direct flush valve).....	$\frac{3}{4}$
Kitchen sink, residential.....	$\frac{1}{2}$	Water closet (tank type).....	$\frac{3}{4}$
Kitchen sink, commercial.....	$\frac{3}{4}$	Water closet (flush valve type).....	1
Lavatory.....	$\frac{3}{4}$	Hose bibs.....	$\frac{1}{2}$
Laundry tray, 1, 2, or 3 compartments.....	$\frac{1}{2}$	Wall hydrant.....	$\frac{1}{2}$
Shower (single head).....	$\frac{1}{2}$		

1002.2 High Street Main Pressures

When street main pressure exceeds 80 p.s.i. an approved pressure reducing valve shall be installed in the water service pipe near its entrance to the building to reduce the water pressure to 80 p.s.i. or lower.

1002.3 Water Hammer

All building water supply systems in which quick acting valves are installed shall be provided with devices to absorb high pressures resulting from the quick closing of these valves. These pressure absorbing devices shall be either air chambers or approved mechanical devices. Water pressure absorbers shall be placed as close as possible to the quick acting valves. They may be installed also at the ends of long pipe runs or near batteries of fixtures.

a. *Air Chambers:* Where air chambers are installed, they shall be in an accessible place and each air chamber shall be provided with a means for restoring the air in event the chamber becomes waterlogged.

b. *Mechanical Devices:* Where mechanical devices are used the manufacturer's specifications shall be followed as to location and method of installation.

1002.4 Inadequate Water Pressure

Whenever water pressure from the street main or other source of supply is insufficient to provide flow pressures at fixture outlets as required under Section 1002.7 a booster pump and pressure tank or other approved means shall be installed on the building water supply system.

1002.5 Variable Street Pressures

Where street water main pressures fluctuate, the building water distribution system shall be designed for the minimum pressure available.

1002.6 Supply Demand

The supply demand in gallons per minute in the building water distributing system shall be determined on the basis of the load in terms of supply fixture units and of the relationship between load and supply demand.*

1002.7 Minimum Pressures Required in Water Distribution System

Based on the minimum static water pressure available, pipe sizes shall be selected so that under conditions of peak demand a minimum flow pressure at the point of discharge shall not be less than shown in Table 1002.7, Minimum Flow Pressure and Flow Rates. In determining minimum pressures at the outlets, allowance shall be made for the pressure drop due to friction loss.

* See section D.3 of the Appendix for details of a suggested procedure.

TABLE 1002.7.—Minimum flow pressure and flow rates

Location	Flow pressure, p.s.i.	Flow rate, g.p.m.	Location	Flow pressure, p.s.i.	Flow rate, g.p.m.
Ordinary basin faucet.....	8	2.0	Shower.....	8	5.0
Self-closing basin faucet.....	8	2.5	Ball-cock for closet.....	8	3.0
Sink faucet, $\frac{3}{4}$ inch.....	8	4.5	Flush valve for closet.....	15	15.35
Sink faucet, $\frac{1}{2}$ inch.....	8	4.5	Flushometer valve for urinal.....	15	15.0
Bath tub faucet.....	8	6.0	Drinking fountains.....	15	0.75
Laundry tub cock, $\frac{1}{2}$ inch.....	8	5.0	Sill cock—wall hydrant.....	10	5.0

† Wide range due to variation in design and type of closet flush valves.

1003. INSTALLING THE BUILDING WATER DISTRIBUTION SYSTEM

1003.1 Water Supply Control Valves

1003.1.1 Stop and Waste Valves Prohibited

Combination stop-and-waste valves or cocks shall not be installed underground in water service piping.

1003.1.2 Curb Valve

On each water service from a street main to a building an approved gate valve or ground key stopcock shall be installed near the curbline between the property line and the curb. This valve or stopcock shall be provided with an approved curb valve box and shall not be under a driveway.

1003.1.3 Building Valve

Each building water service shall be provided with a gate valve or other full-way valves located inside the building near the point the water service enters.

1003.1.4 Meter Valve

A gate valve or other full-way valve shall be installed in the line on the discharge side of each water meter. The valve shall not be less in size than the building water service.

1003.1.5 Riser Valves

Except in single family dwellings a valve shall be installed at the foot of each water supply riser. In multistory buildings a valve shall be installed at the top of each water supply down-feed pipe from a booster system.

1003.1.6 Valves in Dwelling Units

In two-family or multiple family dwelling units one or more control valves shall be provided so that the water to any unit may be shut off without stopping flow of water to other units. These valves shall be readily accessible inside the unit controlled.

1003.1.7 Individual Fixture Valves

In occupied buildings other than dwellings, the water service line to each fixture or other piece of equipment shall be provided with a valve or fixture stop to shut off the water to the fixture or to the room in which it is located. In freezing climates, all sill cocks and wall hydrants shall be separately controlled by a valve inside the building.

1003.1.8 Tank Controls

Supply lines from pressure or gravity tanks shall be valved at or near the tanks.

1003.1.9 Water Heating Equipment Valve

The cold water branch to each hot water storage tank or water heater shall be provided with a valve located near the equipment. Each tank or heater shall be equipped with an approved automatic relief valve as specified in Section 1005.2.

1003.1.10 Valves To Be Accessible

All water supply control valves shall be placed so as to be accessible for service and maintenance. All concealed tub or shower valves shall be provided with renewable seats.

1003.1.11 Control Valve Design

Except to single fixtures, control valves on all water lines shall, when fully opened, have a cross sectional area not less than the cross sectional area of the line in which they are installed.

1003.2 Water Pressure Booster Systems

1003.2.1 Water Pressure Booster Systems Required

When the water pressure in the public water main or individual water supply system is insufficient to supply the probable peak demand flow to all plumbing fixtures and other water needs freely and continuously with the minimum pressures and quantities specified in Section 1002.7 or elsewhere in this Code and in accordance with good practice, the rate of supply shall be supplemented by:

- a. An elevated water tank
- b. A hydro-pneumatic pressure booster system
- c. A water pressure booster pump installed in accordance with Section 1003.2.5.

1003.2.2 Support

All water supply tanks shall be supported in accordance with the building code or other regulations which apply.

1003.2.3 Covers

All water supply tanks shall be covered to keep out unauthorized persons, dirt, and vermin. The covers of gravity tanks shall be vented with a return bend vent pipe having an area not less than the area of the down feed riser pipe and the vent shall be screened with corrosion resistant screen of not less than 16 x 20 mesh.

1003.2.4 Overflows for Water Supply Tanks

Each gravity or suction water supply tank shall be provided with an overflow having a diameter not less than shown in Table 1003.2.4, "Sizes of Overflow Pipes for Water Supply Tanks." The overflow outlet shall discharge above and within not less than six (6) inches of a roof or roof drain, floor or floor drain or over an open water supplied fixture. The overflow outlet shall be covered by a corrosion resistant screen of not less than 16 x 20 mesh to the inch and by 1/4 inch hardware cloth or shall terminate in a horizontal angle seat check valve. Drainage from overflow pipes shall be directed so as not to freeze on roof walkways.

TABLE 1003.2.4.—*Sizes of overflow pipes for water supply tanks*

Maximum capacity of water supply line to tank	Diameter of overflow pipe (inches ID)	Maximum capacity of water supply line to tank	Diameter of overflow pipe (inches ID)
0-50 gpm.....	2	400-700 gpm.....	5
60-150 gpm.....	2½	700-1,000 gpm.....	6
100-200 gpm.....	3	Over 1,000 gpm.....	8
200-400 gpm.....	4		

1003.2.5 *Low Pressure Cut-Off Required on Booster Pumps*

When a booster pump is used on a water pressure booster system and the possibility exists that a positive pressure of 10 psi or less may occur on the suction side of the pump, there shall be installed a low pressure cut-off on the booster pump to prevent the creation of a vacuum or negative pressure on the suction side of the pump, thus cutting off water to other outlets.

1003.2.6 *Potable Water Inlet Control and Location*

Potable water inlets to gravity tanks shall be controlled by a ball-cock or other automatic supply valve so installed as to prevent the tank from overflowing. The inlet shall be terminated so as to provide an accepted air gap but in no case less than 4 inches above the overflow.

1003.2.7 *Tank Drain Pipes*

Each tank shall be provided at its lowest point with a valved pipe to permit emptying the tank which shall discharge as required for overflow pipes and not smaller in size than shown in Table 1003.2.7, "Size of Drain Pipes for Water Tanks."

TABLE 1003.2.7.—*Size of drain pipes for water tanks*

Tank capacity (gallons)	Drain pipe (inches)	Tank capacity (gallons)	Drain pipe (inches)
Up to 750.....	1	3,001 to 5,000.....	2½
751 to 1,500.....	1½	5,001 to 7,500.....	3
1,501 to 3,000.....	2	Over 7,500.....	4

1003.2.8 *Prohibited Location of Potable Supply Tanks*

Potable water gravity tanks or manholes of potable water pressure tanks shall not be located directly under any soil or waste piping.

1003.2.9 *Pressure Tanks—Vacuum Relief*

All potable water pressure tanks shall be provided with a vacuum relief valve at the top of the tank which will operate up to a maximum water pressure of 200 psi and to maximum water temperatures of 200° F. The minimum size of such vacuum relief valves shall be ½ inch.

1003.2.10 *Pumps and Other Appliances*

Water pumps, filters, softeners, tanks, and all other appliances and devices used to handle or treat potable water shall be protected against contamination.

1004. PROTECTION OF POTABLE WATER SUPPLY

1004.1 *General*

A potable water supply system shall be designed, installed and maintained in such manner as to prevent contamination from non-potable liquids, solids, or gases from being introduced into the potable water supply through cross connections or any other piping connections to the system.

1004.2 *Identification of Potable and Nonpotable Water*

In all buildings where dual water distribution systems, one potable water and the other nonpotable water, are installed, each system shall be identified either by color marking or metal tags.

1004.2.1 *Color Marking*

When color marking is used, potable water lines shall be painted green and nonpotable water lines shall be painted yellow. This requirement may be met by painting 3 inch wide bands green or yellow at intervals of not more than 25 feet and at points where piping passes through walls, floors or roofs in which case the bands shall be applied to the piping on both sides of the walls and both above and below the floor or roof. Points of outlets for nonpotable water shall be marked with a tag or color coded.

1004.2.2 *Metal Tags*

When tags are used, potable water lines shall be identified by 3-inch diameter metal tags bearing the legend **SAFE WATER** in letters not less than $\frac{1}{4}$ inch in height. Nonpotable water lines shall be identified by firmly attached, metal tags having the shape of a 4-inch equilateral triangle bearing the legend **WATER UNSAFE** in letters not less than $\frac{1}{4}$ inch in height.

As in the use of color bands, tags shall be attached to pipes at intervals of not more than 25 feet and at either side of points where pipes pass through walls and above and below points where pipes pass through floors or roofs.

1004.3 *Cross Connection Control*

Cross connections between potable water systems and other systems or equipment containing water or other substances of unknown or questionable safety are prohibited except when and where, as approved by the authority having jurisdiction, suitable protective devices such as the reduced pressure zone backflow preventer or equal are installed, tested, and maintained to insure proper operation on a continuing basis.

1004.3.1 *Individual Water Supplies*

Cross connections between an individual water supply and a potable public supply shall not be made unless specifically approved by the authority having jurisdiction.

1004.4 *Interconnections*

1004.4.1 *Public Water Supplies*

Interconnection between two or more public water supplies shall be permitted only with the approval of the health authority having jurisdiction.

1004.5 *Toxic Materials*

1004.5.1 *Construction*

Piping conveying potable water shall be constructed of nontoxic material.

1004.5.2 *Materials and Substances*

No materials or substances that could produce either toxic conditions, taste, odor, or discoloration in a potable water system shall be introduced into or used in such systems.

1004.5.3 *Painting of Water Tanks*

The interior surface of a potable water tank shall not be lined, painted, or repaired with any material which will affect either the taste, odor, color, or potability of the water supply when the tank is placed in or returned to service.

1004.6 *Used Piping*

Piping which has been used for any other purpose than conveying potable water shall not be used for conveying potable water.

1004.7 *Connections to Boilers*

Potable water connections to boiler feed water systems in which boiler water conditioning chemicals are introduced shall be made through an air gap or provided with an approved backflow preventer located in the potable water line before the point where such chemicals are introduced. Boilers shall be equipped with a check valve in the cold water supply to the boiler.

1004.8 Prohibited Connections to Fixtures and Equipment

Connection to the potable water supply system for the following shall be protected against backflow:

- a. Bidets.
- b. Operating, dissection, embalming, and mortuary tables or similar equipment—in such installation the hose used for water supply shall terminate at least 12 inches away from every point of the table or attachments.
- c. Pumps for nonpotable water, chemicals or other substances—priming connections may be made only through an air gap.
- d. Building drainage, sewer or vent systems.
- e. Any other fixture of similar hazard.

1004.9 Refrigerating Unit Condensers and Cooling Jackets

Except where potable water provided for a refrigerator condenser or cooling jacket is entirely outside the piping or tank containing a toxic refrigerant, with two separate thickness of metal separating the refrigerant from the potable water supply inlet connection shall be provided with an approved check valve. Also adjacent to and at the outlet side of the check valve, an approved pressure relief valve set to relieve at 5 psi above the maximum water pressure at the point of installation shall be provided if the refrigeration units contain more than 20 pounds of refrigerants.

1004.10 Used Water Return Prohibited

Except as provided for below, water used for cooling of equipment or other processes shall not be returned to the potable water system. Such water shall be discharged into the drainage system through an air gapped indirect waste. Under conditions where water shortage may occur, the water used for cooling may be used for nonpotable purposes on written approval of the Administrative Authority.

1004.11 Protection Against Backflow and Backsiphonage

1004.11.1 Water Outlets

A potable water system shall be protected against backflow and backsiphonage by providing and maintaining at each outlet;

- a. Air Gap: An air gap as specified herein between the potable water outlet and the flood level rim of the fixture it supplies or between the outlet and any other source of contamination, or
- b. Backflow Preventer: A backflow preventer device or vacuum breaker to prevent the drawing of contamination into the potable water system.

1004.11.2 Minimum Required Air Gap

- a. How Measured: The minimum required air gap shall be measured vertically from the lowest end of a potable water outlet to the flood rim or line of the fixture or receptacle into which it discharges.
- b. Size: The minimum required air gap shall be twice the effective opening of a potable water outlet unless the outlet is a distance less than 3 times the effective opening away from a wall or similar vertical surface in which cases the minimum required air gap shall be 3 times the effective opening of the outlet. In no case shall the minimum required air gap be less than shown in Table 1004.11.2 Minimum Air Gaps for Plumbing Fixtures.

TABLE 1004.11.2.—Minimum air gaps for plumbing fixtures

Fixture	Minimum air gap	
	When not affected by near wall ¹ (inches)	When affected by near wall ² (inches)
Laboratories and other fixtures with effective opening not greater than $\frac{1}{2}$ inch diameter.	1.0	1.50.
Sink, laundry trays, goose-neck bath faucets and other fixtures with effective openings not greater than $\frac{3}{4}$ -inch diameter.	1.5	2.25.
Over rim bath fillers and other fixtures with effective openings not greater than 1 inch diameter.	2.0	3.0.
Drinking water fountains—single orifice $\frac{7}{16}$ (0.437) in. diameter or multiple orifices having total area of 0.150 sq. in. (area of circle $\frac{7}{16}$ in. diameter).	1.0	1.50.
Effective openings greater than 1 inch.	2X diameter of effective opening.	3X diameter of effective opening.

¹ Side walls, ribs or similar obstructions do not affect air gaps when spaced from inside edge of spout opening a distance greater than three times the diameter of the effective opening for a single wall, or a distance greater than four times the diameter of the effective opening for two intersecting walls.
² Vertical walls, ribs, or similar obstructions extending from the water surface to or above the horizontal plane of the spout opening require a greater air gap when spaced closer to the nearest inside edge of spout opening than specified in Note 1, above. The effect of three or more such vertical walls or ribs has not been determined. In such cases, the air gap shall be measured from the top of the wall.

1004.11.3 *Devices for the Protection of the Potable Water Supply*

Approved backflow preventers or vacuum breakers shall be installed with any plumbing fixture or equipment, the potable water supply outlet of which may be submerged and which cannot be protected by a minimum air gap.

1004.11.4 *Approval of Devices*

Before any device for the prevention of backflow or backsiphonage is installed, it shall have first been certified by a recognized testing laboratory acceptable to the Administrative Authority. Devices installed in a building potable water supply distribution system for protection against backflow shall be maintained in good working condition by the person or persons responsible for the maintenance of the system. The Administrative Authority having jurisdiction shall routinely inspect such devices and if found to be defective or inoperative shall require the replacement thereof.

1004.11.5 *Installation of devices*

- Vacuum Breakers:** Vacuum breakers shall be installed with the critical level at least six (6) inches above the flood level rim of the fixture they serve and on the discharge side of the last control valve to the fixture. No shut-off valve or faucet shall be installed beyond the vacuum breaker. For closed equipment or vessels such as pressure sterilizers the top of the vessel shall be treated as the flood level rim but a check valve shall be installed on the discharge side of the vacuum breaker.
- Reduced Pressure Zone Backflow Preventer:** A reduced pressure zone type backflow preventer may be installed subject to full static pressure.
- Devices of All Types:** Backflow and backsiphonage preventing devices shall be accessibly located preferably in the same room with the fixture they serve. Installation in utility or service spaces, provided they are readily accessible, is also permitted.

1004.11.6 *Tanks and Vats—Below Rim Supply*

- Where a potable water outlet terminates below the rim of a tank or vat and the tank or vat has an overflow of diameter not less than given in Table 1003.2.4 "Sizes of Overflow Pipes For Water Supply Tanks." The overflow pipe shall be provided with an air gap as close to the tank as possible.
- The potable water outlet to the tank or vat shall terminate a distance not less than $1\frac{1}{2}$ times the height to which water can rise in the tank above the top of the overflow. This level shall be established at the maximum flow rate of the supply

- to the tank or vat and with all outlets except the air gap, overflow outlet closed.
- c. The distance from the outlet to the high water level shall be measured from the critical point of the potable water supply outlet.

1004.11.7 Protective Devices Required

Approved devices to protect against backflow and backsiphonage shall be installed at all fixtures and equipment where backflow and/or backsiphonage may occur and where a minimum air gap cannot be provided between the water outlet to the fixture or equipment and its flood level rim.

- a. Connections Not Subject to Back Pressure: Where a water connection is not subject to back pressure, a nonpressure type vacuum breaker shall be installed on the discharge side of the last valve on the line serving the fixture or equipment. A list of some conditions requiring protective devices of this kind is given in Table 1004.11.7A, Cross Connections Where Protective Devices Are Required and Critical Level (C-L) Settings for Backflow Preventers.

TABLE 1004.11.7A.—Cross connections where protective devices are required and critical level (C-L) settings for backflow preventers¹

Fixture or equipment	Method of installation
Aspirators and ejectors.....	C-L at least 6 inches above flood level of receptacle.
Dental units.....	On models without built-in vacuum breakers—C-L at least 6" above flood level rim of bowl.
Dishwashing machines.....	C-L at least 6" above flood level of machine. Install on both hot and cold water supply lines.
Flushometers (closet and urinal)....	C-L at least 6" above top of fixture supplied.
Carbage can cleaning machine.....	C-L at least 6" above flood level of machine. Install on both hot and cold water supply lines.
Hose outlets.....	C-L at least 6" above highest point on hose line.
Laundry machines.....	C-L at least 6" above flood level of machine. Install on both hot and cold water supply lines.
Lawn sprinklers.....	C-L at least 12" above highest sprinkler or discharge outlet.
Steam tables.....	C-L at least 6" above flood level.
Tank and vats.....	C-L at least 6" above flood level rim or line.
Trough urinals.....	C-L at least 30" above perforated flush pipe.
Flush tanks.....	Equip with approval ball cock. Where ball cocks touch tank water equip with vacuum breaker at least 1" above overflow outlets. Where ball cock does not touch tank water install ball cock outlet at least 1" above overflow outlet or provide vacuum breaker as specified above.
Hose bibs (where aspirators or ejectors could be connected).	C-L at least 6" above flood level of receptacle served.

- b. Connections Subject to Back Pressure: Where a potable water connection is made to a line, fixture, tank, vat, pump, or other equipment with a hazard of backflow or backsiphonage where the water connection is subject to backpressure, and an air

¹ Critical level (C-L) is defined as the level to which the backflow preventer (vacuum breaker) may be submerged before backflow will occur. Where the C-L is not shown on the preventer, the bottom of the device shall be taken as the C-L.

gap or backflow preventer cannot be installed, the Administrative Authority may require the use of an approved reduced pressure zone backflow preventer and, also, in extreme situations, an approved pressure type vacuum breaker. A partial list of such connections is shown in Table 1004.11.7B, "Partial List of Cross Connections Subject to Back Pressure."

TABLE 1004.11.7B.—*Partial list of cross connections subject to back pressure*

Chemical Lines
Dock Water Outlets
Individual Water Supplies
Industrial Process Water Lines
Pressure Tanks
Pumps
Steam Lines
Swimming Pools
Tank and Vats—Bottom inlets
Hose Bibs

1004.11.8 *Barometric Loop*

Water connections not subject to back pressure where an actual or potential backflow or backsiphonage hazard exists may in lieu of devices specified in Section 1004.11.7 be provided with a barometric loop. Barometric loops shall precede the point of connection.

1005 HOT WATER SUPPLY SYSTEM

In residences and buildings intended for continuous occupancy, hot water shall be supplied to all plumbing fixtures and equipment used for bathing, washing culinary purpose, cleansing, laundry, or building maintenance.

1005.1 *Return Circulation—Where Required*

Hot water supply systems in four-story buildings or buildings where the developed length of hot water piping from the source of hot water supply to the farthest fixture supplied exceeds 100 feet shall be of the return circulation type.

1005.2 *Pressure Relief Valve and Temperature Relief Valve or Energy Cut-Off Devices Required*

Equipment used for heating water or storing hot water shall be protected by approved safety devices in accordance with one of the following methods:

- a. A separate pressure relief valve and a separate temperature relief valve; or
 - b. A combination pressure and temperature relief valve; or
 - c. A separate pressure relief valve and an energy cut-off device.
- All safety devices shall meet the current requirements of the American Standards Association, American Society of Mechanical Engineers, or the Underwriters Laboratories. Listing by Underwriters Laboratories, American Gas Association, or National Board of Boiler and Pressure Vessel Inspectors shall constitute evidence of conformance with these standards. Where a device is not listed by any of these, it must have certification by an approved laboratory as having met these requirements.

1005.2.1 *Pressure Relief Valves*

Pressure relief valves shall meet the ASA standards and the ASME standards when required by the Administrative Authority. The valves shall have a relief rating adequate to meet the pressure conditions in the equipment served. They shall be installed in the cold water supply line to the heating equipment served except where scale formation from hard water may be encountered in which case they may be installed in the hot water supply line from the heating equipment served. There shall be no shutoff valve between the pressure relief valve and the tank. The pressure relief valve must be set to open at not more than 25 psi above the street main pressure or not more than 25 psi above the setting of any house water pressure regulating valve. The setting shall not exceed the tank working pressure.

1005.2.2 Temperature Relief Valves

Temperature relief valves shall be of adequate relief rating, expressed in BTU/HR, for the equipment served. They shall be installed so that the temperature sensing element is immersed in the hottest water within the top 6 inches of the tank. The valve shall be set to open when the stored water temperature is 210° F. (or less).

1005.2.3 Combination Pressure-Temperature Relief Valves

Combination pressure-temperature relief valves may be used for equipment having a storage capacity of not more than 120 gallons provided the other applicable requirements for individual pressure and individual temperature relief valves are met.

1005.2.4 Energy Cut-Off Devices

Energy cut-off devices shall be of adequate performance rating for the equipment served. Immersion type energy cut-off devices shall be installed so that the temperature sensing element is immersed in the hottest water zone of the equipment served and within the top 6 inches of the tank. When approved by the Administrative Authority, contact types shall be installed so that the sensing element is responsive to the highest water temperature within the equipment served and is securely fastened in place.

1005.2.5 Installation of Relief Valves

No check valve or shutoff valve shall be installed between any safety device and the hot water equipment used, nor shall there be any shutoff valve in the discharge pipe from the relief valve. Relief outlets when connected to the building drainage system shall be indirectly connected.

1005.3 Pressure Marking of Hot Water Storage Tank

Hot water storage tanks shall be permanently marked in an accessible place with the maximum allowable working pressure.

1005.4 Drain Cocks or Valves for Hot Water Storage Tanks

Drain cocks or valves for emptying shall be installed at the lowest point of each hot water storage tank.

1006. DISINFECTION OF POTABLE WATER SYSTEM

New or repaired potable water systems shall be disinfected prior to use whenever required by the authority having jurisdiction. The method to be followed shall be that prescribed by the health authority or, in case no method is prescribed by him, the following:

- a. The pipe system shall be flushed with clean, potable water until no dirty water appears at the points of outlet.
- b. The system or part thereof shall be filled with a water-chlorine solution containing at least 50 parts per million of chlorine and the system or part thereof shall be valved off and allowed to stand for 24 hours or
- c. The system or part thereof shall be filled with a water-chlorine solution containing at least 200 parts per million of chlorine and allowed to stand for 3 hours.
- d. Following the allowed standing time the system shall be flushed with clean potable water until no chlorine remains in the water coming from the system.
- e. The procedure shall be repeated if it is shown by a bacteriological examination made by the authority that contamination still persists in the system.

CHAPTER XI

Drainage System

1100. DETERMINING SIZE OF DRAINAGE SYSTEM

1100.1 Load on Drainage Piping

The load on drainage system piping shall be computed in terms of drainage fixture units in accordance with Table 1100.1 and Section 1100.1.1.

TABLE 1100.1.—Fixture unit values for various plumbing fixtures

Type of fixture or group of fixtures	Fixture unit value
Automatic clothes washer (2" standpipe).....	3
Bathroom group consisting of a water closet, lavatory, and bathtub or shower stall:	
Flushometer valve closet.....	8
Tank type closet.....	6
Bathtub ¹ (with or without overhead shower).....	2
Combination sink-and-tray with food disposal unit.....	4
Combination sink-and-tray with one 1½" trap.....	2
Combination sink-and-tray with separate 1½" traps.....	3
Dental unit or cuspidor.....	1
Dental lavatory.....	1
Drinking fountain.....	½
Dishwasher, domestic (gravity drain) ²	2
Floor drains with 2" waste.....	3
Kitchen sink, domestic, with one 1½" waste.....	2
Kitchen sink, domestic, with food waste grinder.....	2
Lavatory with 1¼" waste.....	1
Laundry tray (1 or 2 compartments).....	2
Shower stall, domestic.....	2
Showers (group) per head ²	2
Sinks:	
Surgeon's.....	3
Flushing rim (with valve).....	6
Service (trap standard).....	3
Service (P trap).....	2
Pot, scullery, etc. ²	4
Urinal, pedestal, syphon jet blowout.....	6
Urinal, wall lip.....	4
Urinal stall, washout.....	4
Urinal trough ² (each 6-ft. section).....	2
Wash sink ² (circular or multiple) each set of faucets.....	2
Water closet, tank-operated.....	4
Water closet, valve-operated.....	6
Unlisted fixture drain or trap size:	
1¼" or less.....	1
1½".....	2
2".....	3
2½".....	4
3".....	5
4".....	6

¹ A shower head over a bathtub does not increase the fixture value.

² See Section 1100.1.1 for method of computing unit value of devices with continuous or semicontinuous flows.

1100.1.1 Values for Continuous Flow

Fixture unit values for continuous or semicontinuous flow into a drainage system, such as from a pump, sump ejector, air conditioning equipment, or similar device shall be computed on the basis of one fixture unit for each gallon per minute of flow.

1100.2 Selecting Size of Drainage Piping

Pipe sizes shall be determined from Table 1100.2A, 1100.2B, and 1100.2C on the basis of drainage load computed from Table 1100.1 and Section 1100.1.1.

TABLE 1100.2A.—Maximum loads for horizontal drains

Diameter of drain (in.)	Horizontal fixture branch (f.u.)	Building drain or building sewer			
		Slope			
		1/8 in/ft (f.u.)	1/4 in/ft (f.u.)	1/2 in/ft (f.u.)	3/4 in/ft (f.u.)
1 1/4	1				
1 1/2	3				
2	6				
2 1/2	12			21	26
3 (waste)	132			24	31
4	160	136	180	142	150
5	360		399	216	230
6	620		700	480	575
8	1,400	1,400	1,600	840	1,000
10	2,500	2,500	2,900	1,920	2,300
12	3,900	3,900	4,600	3,500	4,200
15	7,000	7,000	8,300	5,600	6,700
				10,000	12,000

¹ Not more than two water closets or two bathroom groups.

TABLE 1100.2B.—Maximum loads for soil and waste stacks having 1 or 2 branch intervals

Diameter of stack (inches)	Maximum load on stack (f.u.)	Diameter of stack (inches)	Maximum load on stack (f.u.)
1 1/4	2	5	540
1 1/2	4	6	930
2	8	8	2,100
2 1/2	20	10	3,750
3	148	12	5,850
4	240	15	10,500

¹ Not more than 2 water closets or bathroom groups within each branch interval nor more than 4 water closets or bathroom groups on the stack.

TABLE 1100.2C.—Maximum loads for any one branch interval on multistory soil and waste stacks¹

Diameter of stack	Number of branch intervals															Load limit for tall stacks f.u.
	3 f.u.	4 f.u.	5 f.u.	6 f.u.	7 f.u.	8 f.u.	9 f.u.	10 f.u.	11 f.u.	12 f.u.	13 f.u.	14 f.u.	15 f.u.			
2	3														10	
2½	8	7													28	
3½	20	18	17	16											102	
4	100	90	84	80	77	75	73	72	71	70	69	68	68		530	
5	225	205	190	180	175	170	165	162	159	157	156	154	153		1,400	
6	385	350	325	310	300	290	285	280	275	271	268	266	263		2,900	
8	875	785	735	700	675	655	640	630	620	612	606	600	594		7,600	
10	1,560	1,405	1,310	1,250	1,205	1,170	1,140	1,125	1,110	1,095	1,080	1,075	1,062		15,000	
12	2,435	2,195	2,045	1,950	1,880	1,825	1,790	1,755	1,730	1,705	1,685	1,670	1,655		26,000	
15	4,375	3,935	3,675	3,500	3,380	3,280	3,210	3,150	3,110	3,060	3,030	3,000	2,975		50,000	

¹ These limits are applicable only when the maximum load within any 1 branch interval is not greater than $N(\frac{1}{2n} + 1)$, where N=permissible load on a stack of 1 or 2 branch intervals, and n= number of branch intervals on the stack under consideration.

² Not more than 2 water closets or bathroom groups within each branch interval nor more than 6 water closets or bathroom groups on the stack.

1100.3 Minimum Size of Soil and Waste Stacks

No soil or waste stack shall be smaller than the largest horizontal branch connected thereto except that a 4 x 3 W.C. connection shall not be considered as a reduction in pipe size.

1100.4 Minimum Size of Stack Vent or Vent Stack

Any structure in which a building drain is installed shall have at least one stack vent or vent stack carried full size through the roof not less than 3 inches in diameter.

1100.5 Provision for Future Fixtures

When provision is made for the future installation of fixtures, those provided for shall be considered in determining the required sizes of drain and vent pipes. Construction to provide for such future installations shall be terminated with a plugged fitting or fittings.

1100.6 Minimum Size of Underground Drainage Piping

No portion of the drainage system installed underground or below a basement or cellar shall be less than 2 inches in diameter.

1100.7 Sizing of Offsets on Drainage Piping

1100.7.1 Offsets of 45 Degrees or Less

An offset in a vertical stack, with a change of direction of 45 degrees or less from the vertical, may be sized as a straight vertical stack. In case a horizontal branch connects to the stack within 2 feet above or below the offset, a relief vent shall be installed in accordance with Section 1202.3.

1100.7.2 Offsets of More Than 45 Degrees

A stack with an offset of more than 45 degrees from the vertical shall be sized as follows:

The portion of the stack above the offset shall be sized as for a regular stack based on the total number of fixture units above the offset.

The offset shall be sized as for a building drain. Table 1100.2A, Maximum Loads for Horizontal Drains.

The portion of the stack below the offset shall be sized as for the offset or based on the total number of fixture units on the entire stack, whichever is the larger.

A relief vent for the offset shall be installed as provided elsewhere in this Chapter and in no case shall the horizontal branch connect to the stack within 2 feet above or below the offset.

1100.7.3 Offsets in Waste Stacks Serving Kitchen Sinks

In a one- or two-family dwelling only, in which the stack receives the discharge of a kitchen-type sink and also serves as a vent for fixtures connected to the horizontal portion of the branch served by the waste stack, the minimum size of the waste stack up to the highest sink branch connection shall be not less than 2 inches in diameter. Above that point the size of the stack shall be governed by the total number of fixture units vented by the stack.

1100.7.4 Above Highest Branch

An offset above the highest horizontal branch is an offset in the stack-vent and shall be considered only as it affects the developed length of the vent.

1100.7.5 Below Lowest Branch

In the case of an offset in a soil or waste stack below the lowest horizontal branch, there shall be no change in diameter required if the offset is made at an angle of not greater than 45 degrees. If such an offset is made at an angle greater than 45 degrees to the vertical, the required diameter of the offset and the stack below it shall be determined as for a building drain. Table 1100.2A.

1101. DRAINAGE PIPING INSTALLATION

1101.1 Pitch of Horizontal Drainage Piping

Horizontal drainage piping shall be installed in uniform alignment at uniform slopes in accordance with the following requirements and in no case at a slope which will produce a computed velocity of less than two feet per second.

<i>Size of piping</i>	<i>Minimum slope</i>
3" or less	1/4 inch per foot
Over 3"	1/8 inch per foot

1101.2 *Change in Direction*

1101.2.1 *Fittings Used to Change Direction*

Changes in direction in drainage piping shall be made by the appropriate use of 45 degree wyes, long or short sweep quarter bends, sixth, eighth, or sixteenth bends, or by a combination of these or equivalent fittings. Single sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from the horizontal to the vertical. Double sanitary tees may be used in drainage lines only where the direction of flow is from the horizontal to the vertical.

1101.2.2 *Short Sweeps Permitted*

Short sweeps not less than 3 inches in diameter may be used in soil and waste lines where the change in direction of flow is from either the horizontal to the vertical or from the vertical to the horizontal, and may be used for making necessary offsets between the ceiling and the next floor above.

1101.3 *Fittings and Connections*

1101.3.1 *Prohibited Fittings*

No fitting having a hub in the direction opposite to flow, or tee branch shall be used as a drainage fitting. No fitting or connection which has an enlargement chamber or recess with a ledge or shoulder, or reduction in pipe area shall be used. No running threads, bands, or saddles shall be used. No drainage or vent piping shall be drilled or tapped unless otherwise permitted by the Administrative Authority.

1101.3.2 *Heel or Side-Inlet Bends*

A heel or side-inlet quarter bend shall not be used as a vent when the inlet is placed in a horizontal position.

1101.3.3 *Obstruction to Flow*

No fitting, connection, device, or method of installation which obstructs or retards the flow of water, wastes, sewage, or air in the drainage or venting systems in an amount greater than the normal frictional resistance to flow, shall be used unless it is indicated as acceptable in this Code or is approved by the Administrative Authority as having a desirable and acceptable function and as of ultimate benefit to the proper and continuing functioning of the plumbing system. The enlargement of a 3-inch closet bend or stub to 4 inches shall not be considered an obstruction, provided the horizontal flow line or insert is continuous without forming a ledge.

1101.4 *Dead Ends*

In the installation or removal of any part of a drainage system, dead ends shall be avoided except where necessary to extend a cleanout so as to be accessible.

1101.5 *Building Drains Below Building Sewer*

Building drains which cannot be discharged to the sewer by gravity flow shall be discharged into a tightly covered and vented sump from which the liquid shall be lifted and discharged into the building gravity drainage system by automatic pumping equipment or by any equally efficient method approved by the Administrative Authority.

1101.5.1 *Design of Sumps*

Sump and pumping equipment shall be so designed as to discharge all contents accumulated in the sump during the cycle of emptying operation and the storage of drainage in a sump or ejector shall not exceed 12 hours. Sumps in other than one- or two-family residences receiving the discharge of six or more water closets shall be provided with duplex pumping equipment. The sump vent shall be of proper size to meet the venting requirement based on the discharge rate of the sump pump.

CHAPTER XII

Vents and Venting

1200. SELECTING SIZE OF VENT PIPING

1200.1 General

Vent pipe sizes shall be determined from Table 1200 on the basis of length and drainage load computed from Table 1100.1 and Section 1100.1.1.

1200.2 Minimum Diameter of Vent Piping

No vent pipe shall be less than $1\frac{1}{4}$ inches in diameter.

1200.3 Individual Vents

The diameter of the individual vent shall be at least one-half the diameter of the drain served.

1200.4 Relief Vents

The diameter of a relief vent shall be at least one-half the diameter of the soil or waste branch served.

TABLE 1200.—Size and length of vents

Size of soil or waste stack	Total fixtures connected to stack	Diameter of vent (inches)										
		$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	5	6	8	10	12
		(Maximum length of vent given in feet)										
$1\frac{1}{4}$	2	30										
$1\frac{1}{2}$	8	50	150									
$1\frac{3}{4}$	10	30	100									
2	12	30	75	200								
2	20	26	50	150								
$2\frac{1}{2}$	42		30	100	300							
3	10		42	145	355	1,040						
3	21		32	110	270	845						
3	53		27	94	230	680						
3	102		25	86	210	620						
4	43			35	85	250	975					
4	140			27	65	195	750					
4	320			23	55	165	635					
4	530			21	50	150	560					
5	190				28	82	320	985				
5	490				21	63	245	760				
5	940				18	53	207	670				
5	1,400				16	49	189	585				
6	500					33	130	400	1,000			
6	1,100					26	109	310	775			
6	2,000					22	84	260	655			
6	2,500					20	77	240	595			
8	1,400						31	95	240	940		
8	3,400						24	73	185	720		
8	5,600						20	62	155	610		
8	7,600						18	56	140	555		
10	4,000							31	78	305	960	
10	7,200							24	60	235	735	
10	11,000							20	51	200	625	
10	15,000							18	46	180	570	
12	7,300								31	120	380	940
12	13,900								24	94	295	720
12	20,000								20	79	250	610
12	29,000								18	72	225	555
15	17,000									40	125	305
15	25,000									31	96	255
15	38,000									26	81	200
15	50,000									24	74	180

1200.5 *Circuit or Loop Vents*

The diameter of circuit or loop vents shall be at least one-half the diameter of the horizontal soil or waste branch served or one-half the diameter of the vent stack whichever is smaller.

1201. PROTECTION OF TRAP SEALS

The protection of trap seals from siphonage or back pressure shall be accomplished by the appropriate use of soil or waste stacks, vents, revents, back vents, dry vents, wet vents, loop vents, circuit or continuous vents, or combinations thereof, installed in accordance with the requirements of this chapter, so that at no time shall the trap be subjected to a pressure differential or more than 1 inch of water.

1202. VENT STACKS AND STACK VENTS

1202.1 *Vent Stack Required*

Every building in which plumbing is installed shall have at least one main stack, which shall run undiminished in size and as directly as possible, from the building drain through to the open air above the roof. A vent stack or a main vent shall be installed with a soil or waste stack whenever back vents, relief vents, or other branch vents are required in a building of three or more branch intervals.

1202.2 *Connections at Base and Top*

All main vents or vent stacks shall connect full size at their base to the drainage of the building or to the main soil or waste pipe, at or below the lowest fixture branch. All vent pipes shall extend undiminished in size above the roof, or shall be reconnected with the main soil or waste stack above the highest fixture connection discharging into it.

1202.3 *Offsets in Building Five or More Stories*

Except as provided in Section 1100.7, offsets of less than 45 degrees from the horizontal in a soil or waste stack may be vented as two separate soil or waste stacks and may be vented by installing a relief vent as a vertical continuation of the lower section of the stack or as a side vent connected to the lower section between the offset and the next lower fixture or horizontal branch. The upper section of the offset shall be provided with a yoke vent. The diameter of the vents shall not be less than the diameter of the main vent, or of the soil and waste stack, whichever is the smaller.

1202.4 *Vent Headers*

Where stack vents and vent stacks are connected into a vent header, such connections shall be made at the tops of the stacks. The vent header shall connect to a vent extension through the roof.

1203. VENT TERMINALS

1203.1 *Extension Above Roofs*

Extension of vent pipes through a roof shall be terminated at least 12 inches above it. Where a roof is to be used for any purpose other than weather protection, the vent extensions shall be run at least 7 feet above the roof.

1203.2 *Waterproof Flashings*

Each vent terminal shall be made watertight with the roof by proper flashing.

1203.3 *Flag Poling Prohibited*

Vent terminals shall not be used for the purpose of flag poling, TV aerials, or similar purposes.

1203.4 *Location of Vent Terminal*

No vent terminal shall be located directly beneath any door, window, or other ventilating opening of the building or of an adjacent building nor shall any such vent terminal be within 10 feet horizontally of such an opening unless it is at least 2 feet above the top of such opening.

1203.5 Extensions Through Wall

Vent terminals extending through a wall, when approved by the Administrative Authority, shall be at least 10 feet horizontally from any lot line and terminate upward. They shall be effectively screened and shall meet the requirements of Section 1203.4. Vent terminals shall not terminate under the overhang of a building.

1203.6 Extensions Outside Building

No soil, waste, or vent pipe extension shall be run or placed on the outside of a wall of any new building, but shall be carried up inside the building except that in those localities where the temperature does not drop below 32 degrees F., the Administrative Authority may approve the installation outside the building.

1204. VENT GRADES AND CONNECTIONS

1204.1 Vent Grade

All vent and branch vent pipes shall be so graded and connected as to drain back to the soil or waste pipe by gravity.

1204.2 Vertical Rise

Where vent pipes connect to a horizontal soil or waste pipe, the vent shall be taken off above the center line of the soil pipe. The vent pipe shall rise vertically, or at an angle not more than 45 degrees from the vertical, to a point at least 6 inches above the flood-level rim of the fixture it is venting, before offsetting horizontally or before connecting to the branch vent.

1204.3 Height Above Fixtures

A connection between a vent pipe and a vent stack or stack-vent shall be made at least 6 inches above the flood-level rim of the highest fixture served by the vent. Horizontal vent pipes forming branch vents, relief vents, or loop vents shall be at least 6 inches above the flood-level rim of the highest fixture served.

1204.4 Side-Inlet

Side-inlet closet bends are permitted only in cases where the fixture connecting thereto is vented, and in no case shall the inlet be used to vent a bathroom group without being washed by a fixture.

1205. WET VENTING

1205.1 Single Bathroom Groups

A single bathroom group of fixtures may be installed with the drain from a back-vented lavatory, kitchen sink, or combination fixture serving as a wet vent for a bathtub or shower stall and for a water closet, provided that:

- a. Not more than one fixture unit is drained into a 1½-inch diameter wet vent or not more than four fixture units drain into a 2-inch diameter wet vent.
- b. The horizontal branch drain connects to the stack at the same level as the water-closet drain or below the water-closet drain when installed on the top floor. It may also connect to the water-closet bend.

1205.2 Double Bathroom Groups—Back-to-Back

Bathroom groups back-to-back on top floor consisting of two lavatories and two bathtubs or shower stalls may be installed on the same horizontal branch with a common vent for the lavatories and with no back vent for the bathtubs or shower stalls and for the water closets, provided the wet vent is not less than 1½ inches in diameter.

1205.3 Multistory Bathroom Groups

On the lower floors of a multistory building, the waste pipe from one or two lavatories may be used as a wet vent for one or two bathtubs or showers provided that:

- a. The wet vent and its extension to the vent stack is not less than 1½ inches in diameter.
- b. Each water closet below the top floor is individually back vented.
- c. The vent stack is sized as given in Table 1205.3, Size of Vent Stacks.

TABLE 1205.3.—Size of vent stacks

Number of wet-vented fixtures	Diameter of vent stack (inches)
1 or 2 bathtubs or showers	2
3 to 5 bathtubs or showers	2½
6 to 9 bathtubs or showers	3
10 to 16 bathtubs or showers	4

1205.4 Exception to Wet Venting Multistory Bathroom Groups

In multistory bathroom groups, wet vented in accordance with Section 1205.3, the water closets below the top floor need not be individually vented if the 2-inch waste connects directly into the water closet bend at a 45 degree angle to the horizontal portion of the bend in the direction of flow or if a special stack fitting is used which consists of a 3-inch water closet opening and two side outlets each 1½ or 2 inches in diameter, having their invert above the center line of, but below the top of the 3-inch water closet opening.

1206. STACK VENTING

1206.1 One Bathroom Group

Except as indicated in Section 1206.2, a group of fixtures, consisting of one bathroom group and a kitchen sink or combination fixture, may be installed without individual fixture vents, in a one-story building or on the top floor of a building, provided each fixture drain connects independently to the stack and the water closet and bathtub or shower stall drain enters the stack at the same level and in accordance with the requirements in Table 1205.3, Size of Vent Stacks.

1206.2 Overtaxed Sewers

Where a sink or combination fixture connects to the stack-vented bathroom group, and when the street sewer is sufficiently overloaded to cause frequent submergence of the building sewer, a relief vent or back-vented fixture shall be connected to the stack below the stack-vented water closet or bathtub.

1207. INDIVIDUAL FIXTURE REVENTING

1207.1 Where Required

When fixtures other than water closets discharge downstream from a water closet, each fixture connecting downstream shall be individually vented, under the provisions set down in this Code.

1207.2 Horizontal Branches

One sink and one lavatory, or three lavatories within 8 feet developed length of a main-vented line may be installed on a 2-inch horizontal waste branch without reventing, provided the branch is not less than 2 inches in diameter throughout its length, and provided the wastes are connected into the side of the branch and the branch leads to its stack connection with a pitch of not more than ¼ inch per foot.

1207.3 Load Limit for Fixtures Above Bathtubs and Water Closets Without Reventing

The total drainage load placed on a soil or waste stack above the highest water closet or bathtub connection without the use of revents shall not exceed three fixture units, provided:

- The soil or waste stack is not less than 3 inches in diameter.
- The total load on the stack is in accordance with the applicable provisions of Chapter 11, and
- The waste piping of the fixtures above the water closet or bathtub connection is in accordance with Section 1207.2.

1208. COMMON VENTS

1208.1 Individual Vent As Common Vent

An individual vent, installed vertically, may be used as a common vent for two fixture traps when both fixture drains connect with a vertical drain at the same level.

1208.2 *Fixtures Connected to Stack at Different Levels*

A common vent may be used for two fixtures set on the same floor level but connecting at different levels in the stack, provided the vertical drain is one pipe diameter larger than the upper fixture drain but in no case smaller than the lower fixture drain, whichever is the larger and that both drains conform to Tables 1100.2 A, B, and C.

1209. CIRCUIT AND LOOP VENTING

1209.1 *Battery Venting*

A branch soil or waste pipe to which two but not more than eight water closets (except blow-out type), pedestal urinals, trap standard to floor fixture, shower stalls, or floor drains are connected in battery, shall be vented by a circuit or loop vent which shall be taken off in front of the last fixture connection of the battery. In addition, lower-floor branches serving more than three water closets shall be provided with a relief vent taken off in front of the first fixture connection of the battery. When lavatories or similar fixtures discharge such branches, each vertical branch from such fixtures shall be provided with a continuous vent.

1209.2 *Dual Branches*

When parallel horizontal branches serve a total of eight water closets (four on each branch), each branch shall be provided with a relief vent at a point between the two most distant water closets. When fixtures such as lavatories discharge into the horizontal branch drain, each such fixture shall be vented.

1209.3 *Vent Connections*

When the circuit, loop or relief vent connections are taken off the horizontal branch, the vent branch connection shall be taken off at a vertical angle or from the top of the horizontal branch.

1209.4 *Fixtures Back-to-Back in Battery*

When fixtures are connected to one horizontal branch through a double wye or a sanitary tee in a vertical position, a common vent for each two fixtures back-to-back or double connection shall be provided. The common vent shall be installed in a vertical position as a continuation of the double connection.

1210. FIXTURES BACK-TO-BACK

Two fixtures set back-to-back, within the distance allowed between a trap and its vent, may be served with one continuous soil or waste-vent pipe, provided that each fixture wastes separately into an approved double fitting having inlet openings at the same level. (See Section 1208.2.)

1211. FIXTURE VENTS

1211.1 *Distance of Trap From Vent*

Each fixture trap shall have a protecting vent so located that the slope and the developed length in the fixture drain from the trap weir to the vent fitting are within the requirements set forth in Table 1211.1, Distance of Fixture Trap From Vent.

TABLE 1211.1.—Distance of fixture trap from vent

Size of fixture drain, inches	Distance— Trap to vent
1 $\frac{1}{4}$	2 ft. 6 in.
1 $\frac{1}{2}$	3 ft. 6 in.
2	5 ft.
3	6 ft.
4	10 ft.

1211.2 *Trap Dip*

The vent pipe opening from a soil or waste pipe, except for water closets and similar fixtures, shall not be below the weir of the trap.

1211.3 *Crown Venting Limitation*

No vent shall be installed within two pipe diameters of the trap weir.

1212. VENTS FOR FIXTURE TRAP BELOW TRAP DIP

1212.1 Hydraulic Gradient

Fixture drains shall be vented within the hydraulic gradient between the trap outlet and vent connection, but in no case shall the unvented drain exceed the distance provided for in Table 1211.1, Distance of Fixture Trap From Vent.

1213. RELIEF VENTS FOR STACKS OF MORE THAN TEN BRANCH INTERVALS

Soil and waste stacks in buildings having more than 10 branch intervals shall be provided with a relief vent at each tenth interval installed, beginning with the top floor. The size of the relief vent shall be equal to the size of the vent stack to which it connects. The lower end of each relief vent shall connect to the soil or waste stack through a wye below the horizontal branch serving the floor and the upper end shall connect to the vent stack through a wye not less than 3 feet above the floor level.

1214. COMBINATION WASTE-AND-VENT SYSTEM

1214.1 Where Permitted

A combination waste-and-vent system shall be permitted only where structural conditions preclude the installation of a conventional system as otherwise provided in this Code.

1214.2 Bar and Fountain Sink Traps

Traps serving sinks which are part of the equipment of bars, soda fountains, and counters need not be vented when the location and construction of such bars, soda fountains, and counters are such as to make it impossible to do so. When such conditions exist, such sinks shall discharge into floor sink or hopper which is properly trapped and vented.

1214.3 Limits of Use

A combination waste-and-vent system is limited to floor drains and sinks. It consists of an installation of waste piping in which the trap of the fixture is not adequately vented. Every drainage pipe and trap in the waste-and-vent system shall be at least two pipe sizes larger than the size required in Section 1100.2.

1215. VENTING OF SUMPS AND SEWERS

Drainage piping below sewer level shall be vented in similar manner to that for a gravity system. Building sump vents shall be sized in accordance with Table 1200., Sizes and Lengths of Vents, but in any case not less than 1½ inches. Vents from pneumatic ejectors of similar equipment shall be terminated separately at the open air.

1216. FROST CLOSURE

Where there is a possibility of frost closure, the vent extension through a roof shall be at least 3 inches in diameter. When it is found necessary to increase the size of the vent terminal, the change in diameter shall be made inside the building. Change in diameter of vent terminals shall be made by use of a long increaser at least 1 foot below the roof.

CHAPTER XIII

Storm Drains

1300. WHERE REQUIRED

All roofs, paved areas, yards, courts and courtyards shall be drained into a separate storm-sewer system, or a combined-sewer system where such systems are available, or to a place of disposal satisfactory to the Administrative Authority. In the case of domestic homes, storm water may be discharged on flat areas such as streets or lawns so long as the storm water will flow away from the building.

1301. STORM WATER DRAINAGE TO SEWER PROHIBITED

Storm water shall not be drained into sewers intended for sewage only.

1302. SIZE OF STORM DRAINS AND LEADERS

1302.1 Size of Building Storm Drain

The size of the building storm drain or any of its horizontal branches having a slope of $\frac{1}{4}$ inch or less per foot, shall be based upon the maximum projected roof or paved area to be handled according to the following Table 1302.1, Size of Horizontal Storm Drains.

TABLE 1302.1.—Size of horizontal storm drains ¹

Diameter of drain, inches	Maximum projected roof area for drains of various slopes		
	$\frac{1}{8}$ in. slope	$\frac{1}{4}$ in. slope	$\frac{1}{2}$ in. slope
	<i>Square feet</i>	<i>Square feet</i>	<i>Square feet</i>
3.....	822	1,160	1,644
4.....	1,880	2,650	3,760
5.....	3,340	4,720	6,680
6.....	5,350	7,550	10,700
8.....	11,500	16,300	23,000
10.....	20,700	29,200	41,400
12.....	33,300	47,000	66,600
15.....	59,500	84,000	119,000

¹ Table 1302.1 is based upon a maximum rate of rainfall of 4 inches per hour. If in any State, city, or other political subdivision, the maximum rate of rainfall is more or less than 4 inches per hour, then the figures for the roof area must be adjusted proportionately by multiplying the figure by 4 and dividing by the maximum rate of rainfall in inches per hour.

1302.2 Size of Vertical Leaders

Vertical leaders shall be sized on the maximum projected roof area, according to Table 1302.2, Size of Vertical Leaders.

TABLE 1302.2.—Size of vertical leaders ¹

Size of leader or conductor, ² inches	Maximum projected roof area, square feet
2.....	720
2½.....	1,300
3.....	2,200
4.....	4,600
5.....	8,650
6.....	13,500
8.....	29,000

¹ Table 1302.2 is based upon a maximum rate of rainfall of 4 inches per hour. If in any State, city, or other political subdivision, the maximum rate of rainfall is more or less than 4 inches per hour, then the figures for roof area must be adjusted proportionately by multiplying the figure by 4 and dividing by the maximum rate of rainfall in inches per hour.

² The equivalent diameter of square or rectangular leader may be taken as the diameter of that circle which may be inscribed within the cross-sectional area of the leader.

1302.3 Size of Roof Gutters

The size of semicircular gutters shall be based on the maximum projected roof area, according to Table 1302.3, Size of Roof Gutters.

TABLE 1302.3.—Size of roof gutters¹

Diameter of gutter ¹ inches	Maximum projected roof area for gutters of various slopes			
	$\frac{1}{8}$ in. slope	$\frac{3}{8}$ in. slope	$\frac{1}{2}$ in. slope	$\frac{3}{4}$ in. slope
	<i>Square feet</i>	<i>Square feet</i>	<i>Square feet</i>	<i>Square feet</i>
3.....	170	240	340	480
4.....	360	510	720	1,020
5.....	625	880	1,250	1,770
6.....	960	1,360	1,920	2,770
7.....	1,380	1,950	2,760	3,900
8.....	1,990	2,800	3,980	5,600
10.....	3,600	5,100	7,200	10,000

¹ Gutters other than semicircular may be used provided they have an equivalent cross-sectional area.

1302.4 Size of Combined Drains and Sewers

To compute the size of a combined drain and sewer the method of Section 1302.1 shall be used. The fixture units shall be converted into an equivalent projected roof or paved area. When the total fixture load on the combined drain is less than 256 fixture units, the equivalent drainage area in horizontal projection shall be taken as 1,000 square feet. When the total fixture load exceeds 256 units, each additional fixture unit shall be considered the equivalent of 3.9 square feet of drainage area.

1302.5 Values for Continuous Flow

Where there is a continuous or semicontinuous discharge into the building storm drain or building storm sewer, as from a pump, ejector, air-conditioning plant, or similar device, each gallon per minute of such discharge shall be computed as being equivalent to 24 square feet of roof area, based upon a 4-inch rainfall.

1303. BUILDING SUBDRAINS

Building subdrains located below the public sewer level shall discharge into a sump or receiving tank the contents of which shall be automatically lifted and discharged into the drainage system as required for building sumps.

1304. SUBSOIL DRAINS

When the subsoil drain for a building is subject to back-water, it shall be protected by an accessibly located backwater valve. Subsoil drains may discharge into a properly trapped area drain or sump. Such sumps do not require vents.

1305. TRAPS ON STORM DRAINS AND LEADERS

1305.1 Where Required

Leaders and storm drains when connected to a combined sewer shall be trapped. Floor drains connected to a storm drain shall be trapped.

1305.2 Where Not Required

No traps shall be required for storm-water drains which are connected to a sewer carrying storm water exclusively.

1305.3 Trap Material

Storm water traps, when required, shall be of cast iron.

1305.4 Trap Size

Traps for individual conductors shall be the same size as the horizontal drain to which they are connected.

1305.5 Method of Installation

Individual storm-water traps shall be installed on the storm-water drain branch serving each conductor, or a single trap shall be installed in the main storm drain just before its connection with the combined

building sewer main, drain, or public sewer. Conductor traps shall be located so that an accessible cleanout may be installed on the building side of the trap.

1306. CONDUCTORS AND CONNECTIONS

1306.1 *Not To Be Used Improperly*

Conductor pipes shall not be used as soil, waste, or vent pipes nor shall drainage or vent pipes be used as conductors.

1306.2 *Protection of Rain Water Conductors*

Rain water conductors installed along alley ways, driveways, or other locations where they may be exposed to damage shall be protected by metal guards, recessed into the wall, or constructed from ferrous alloy pipe.

1306.3 *Combining Storm With Sanitary Drainage*

The sanitary and storm-drainage system of a building shall be entirely separate, except that where a combined sewer is available, the building storm drain may be connected in the same horizontal plane through a single Y fitting to the combined drain or sewer at least 10 feet downstream from any soil stack.

1306.4 *Double Connections of Storm Drains*

Where the sanitary and storm drains are connected on both sides of the combined sewer, single Y's shall be used and the requirements of Section 1306.3 relative to the location of connections shall also apply.

1307. ROOF DRAINS

1307.1 *Material of Roof Drains*

Roof drains shall be of cast iron, copper, lead, or other acceptable corrosion-resisting material.

1307.2 *Roof Drain Strainers*

1307.2.1 *General Use*

All roof areas, except those draining to hanging gutters, shall be equipped with roof drains having strainers extending not less than 4 inches above the surface of the roof immediately adjacent to the roof drain. Strainers shall have an available inlet area, above roof level, of not less than $1\frac{1}{2}$ times the area of the conductor or leader to which the drain is connected.

1307.2.2 *Flat Decks*

Roof drain strainers for use on sun decks, parking decks, and similar areas, normally serviced and maintained, may be of the flat surface type, level with the deck and shall have an available inlet area not less than 2 times the area of the conductor or leader to which the drain is connected.

1307.3 *Roof Drain Flashings Required*

The connection between roofs and roof drains which pass through the roof and into the interior of the building shall be made watertight by the use of proper flashing material.

1308. EXPANSION JOINTS REQUIRED

Expansion joints or sleeves shall be provided where warranted by temperature variations or physical conditions.

1309. SANITARY AND STORM SEWERS

Where separate systems of sanitary drainage and storm water are installed in the same property, the storm and sanitary building sewers and drains may be laid side by side in the same trench.

CHAPTER XIV

Inspections, Tests, and Maintenance

1400. INSPECTIONS

1400.1 *New Work*

Every new plumbing system and every part of an existing system which has been altered, extended, renovated or repaired, except for minor repairs, shall be inspected to ascertain whether it complies with the requirements of the Code, the rules and regulations promulgated thereunder.

1400.2 *Notification*

1400.2.1 *Notice*

The holder of a permit shall give notice to the Administrative Authority as soon as the plumbing work provided for in the permit is completed and ready for test or inspection.

1400.2.2 *Plumbers Responsibility*

The holder of a permit shall not give notice of readiness for inspection unless he believes that the work to be inspected is in compliance with the Code.

1400.2.3 *Retesting*

If on inspection the Administrative Authority determines that the work has not passed any test, it shall submit a report of its findings to the person seeking approval thereof who shall cause all necessary corrections to be made in accordance with Section 1402 of the Code and to resubmit the work for testing.

1400.2.4 *Representation at Test*

Tests required by Section 1402.1 shall be conducted in the presence of a representative of the Administrative Authority.

1401. REINSPECTIONS

Reinspections of plumbing installations or any part thereof shall be made when deemed necessary or desirable by the Administrative Authority.

1402. TESTING OF PLUMBING SYSTEMS

1402.1 *New, Altered, Extended, or Repaired Systems*

New plumbing systems and parts of existing systems which have been altered, extended or repaired shall be tested as prescribed hereinafter to disclose leaks and defects, except that testing may be waived in the following cases:

- a. In any case which does not include addition to, replacement, alteration, or relocation of any water supply, drainage or vent piping; and
- b. In any case where plumbing equipment may be set up temporarily for exhibition purposes.

1402.2 *Defective Plumbing*

Where there is reason to believe that the plumbing system of any building has become defective, it shall be subjected to test or inspection and any defects found shall be corrected.

1402.3 *Exposure of Work*

All new, altered, extended or replaced plumbing shall be left uncovered and unconcealed until it has been tested and approved. Where such work has been covered or concealed before it is tested and approved, it shall be exposed for testing.

1402.4 *Equipment, Material and Labor for Tests*

All equipment, material and labor required for testing a plumbing system or part thereof shall be furnished by the plumbing contractor responsible for installing the work.

1402.5 *Test Methods*

1402.5.1 *Drainage and Vent Systems*

a. **Rough Plumbing:** Except for outside leaders and perforated or open jointed drain tile, the piping of plumbing drainage and venting systems shall be tested upon completion of the rough piping installation by water or air and proved watertight. The Administrative Authority may require the removal of any clean-out plugs to ascertain if the pressure has reached all parts of the system. Either of the following test methods shall be used:

- (1) **Water Test:** The water test shall be applied to the drainage system either in its entirety or in sections after rough piping has been installed. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system filled with water to point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest opening of the section under test, and each section shall be filled with water but no section shall be tested with less than 10-foot head of water. In testing successive sections at least the upper 10 feet of the next preceding section shall be tested, so that no joint or pipe in the building (except the uppermost 10 feet of the system) shall have been submitted to a test of less than a 10-foot head of water. The water shall be kept in the system or in the portion under test for at least 15 minutes before inspection starts; the system shall then be tight at all points.
- (2) **Air Test:** The air test shall be made by attaching an air compressor testing apparatus to any suitable opening and after closing all other inlets and outlets to the system, forcing air into the system until there is a uniform gauge pressure of 5 pounds per square inch or sufficient to balance a column of mercury 10 inches in height. This pressure shall be held without introduction of additional air for a period of at least 15 minutes.

b. **Finished Plumbing:** After the plumbing fixtures have been set and their traps filled with water, the entire drainage system shall be tested and proved gastight. The following test method shall be employed:

- (1) **Final Test for Gastightness:** The final test of the completed drainage and vent system may be either a smoke test or a peppermint test. Where the smoke test is preferred, it shall be made by filling all traps with water and then introducing into the entire system a pungent thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, they shall be closed and a pressure equivalent to a 1-inch water column shall be built and maintained for the period of the inspection. Where the peppermint test is preferred, 2 ounces of oil of peppermint shall be introduced into the roof vent terminal of every line or stack to be tested. The oil of peppermint shall be followed at once by 10 quarts of hot (160° F. or higher) water whereupon all roof vent terminals shall be sealed. A positive test, which reveals leakage, shall be the detection of the odor of peppermint at any trap or other point on the system. Oil of peppermint or persons whose person or clothes have come in contact with oil of peppermint shall be excluded from the test area.

1402.5.2 *Building Sewer*

The building sewer shall be tested by insertion of a test plug at the point of connection with the public sewer. It shall then be filled with water under a head of not less than 10 feet. The water level

at the top of the test head of water shall not drop for at least 15 minutes.

1402.5.3 *Water Supply System*

Upon completion of a section or of the entire water supply system, it shall be tested and proved tight under a water pressure not less than the working pressure under which it is to be used. The water used for tests shall be obtained from a potable source of supply.

1403. MAINTENANCE

The plumbing and drainage system of every building shall be maintained in such a manner as to be at all times in compliance with the provisions of the Code, except that existing plumbing installed under prior regulations or lack thereof, may remain unchanged unless immediate hazards to health, life, or property are evident.

APPENDIX A

Individual Water Supply

A.1 WHERE REQUIRED

Where a potable public water supply is not available individual sources of potable water supply shall be utilized.

A.2 TYPES OF INDIVIDUAL WATER SUPPLY

Dependent upon geological and soil condition and the amount of rainfall, individual water supplies are of the following types: drilled well, driven well, dug well, bored well, spring, stream or cistern. Because of the danger of contamination, surface bodies of water and land cisterns shall not be used as sources of individual water supply, unless properly treated by acceptable means.

A.3 QUANTITY AND QUALITY OF WATER FOR RESIDENTIAL USE

A.3.1 *Minimum Quantity*

For ordinary residential use, not less than 50 gallons per person per day shall be provided. The combined capacity of the source and storage on the system for delivery of water to the residences shall be adequate to supply the fixtures at their design demand rates.

A.3.2 *Water Quality*

Water from an individual water supply shall be certified as potable by the authority having jurisdiction prior to connection to the plumbing system.

A.3.3 *Chlorination of System*

After construction or major repair, the private potable water supply shall be chlorinated by the individual doing the work to remove any contamination which may have gained entry. Directions on chlorination of private water supplies may be found in "Manual of Individual Water Supply Systems," Public Health Service Publication No. 24. (Revised 1962.)

A.4 PROTECTION OF SUPPLY

An individual water supply shall be so located and constructed as to be safeguarded against contamination.

A.4.1 *Well Locations*

No potable ground water source or pump suction line shall be located closer to potential sources of contamination than the distances shown in Table A.4.1. Distances From Source of Contamination to Individual Water Supplies and Pump Suction Lines.

In the event the underlying rock structure is limestone or fragmented shale, the local or State health department shall be consulted on well site location.

Wells in residential areas should be located so as to anticipate the effect of new construction on the safety of the water supply. Wherever possible, however, a community public water system should be installed.

TABLE A.4.1.—Distances from source of contamination to individual water supplies and pump suction lines

Source of contamination	Distance (feet) ¹	Source of contamination	Distance (feet) ¹
Sewer.....	50	Subsurface disposal fields.....	≥ 100
Septic tanks.....	50	Seepage pits.....	100
Subsurface pits.....	50	Cesspools.....	150
Pasture.....	100	Barnyard.....	100
Sewer of cast iron (leaded or mechanical joints).....	10	Farm silo.....	25
		Pumphouse floor drain of cast iron draining to ground surface.....	2

¹ These distances constitute minimum separation and shall be increased in areas of creviced rock or limestone, or where the direction of movement of the ground water is from sources of contamination toward the well.

² When approved by the authority having jurisdiction, and under special soil conditions, this distance may be reduced. However, a minimum separation of not less than 50 feet shall be maintained.

A.4.2 Elevation

Well sites shall be positively drained and should be at higher elevations than potential sources of contamination.

A.4.3 Depth

Individual potable well supplies shall not be developed from a water table located less than 10 feet below the ground surface and not less than 20 feet is preferable.

A.4.4 Casings

a. Watertight Casings

Each well shall be provided with a watertight casing to a distance of at least 10 feet below the ground surface. All casings shall extend at least 6 inches above the well platform. The casing shall be large enough to permit installation of a separate drop pipe. Casings should, preferably, be sealed at the bottom in an impermeable stratum or extended several feet into the water-bearing stratum.

b. Drilled or Driven Well Casings

Drilled or driven well casings shall be of steel, wrought iron, or other suitable material. Where drilled wells extend into a rock formation, the well casing shall extend to and set firmly in the formation. The annular space between the earth and the outside of the casing shall be filled with cement grout to a distance of at least 10 feet below the ground surface. In an instance of casing-to-rock installation, the grout shall extend to the rock surface.

c. Dug or Bored Well Casings

Dug or bored well casings shall be of watertight concrete, or other impervious material, to a distance of at least 10 feet below the ground surface. Where the water table is more than 10 feet below the ground surface, the watertight casing should extend below the water table surface. Well casings for dug or bored wells may be built of section of concrete, tile galvanized or corrugated metal pipe. When used, these should be surrounded by 6 inches of grout poured into the hole between the outside of the casing and the ground to a depth of at least 10 feet.

A.4.5 Cover

Every potable water well shall be equipped with an overlapping watertight cover at the top of the casing wall or pipe sleeve so that contaminated water or other substances cannot enter the well through the annular opening at the top of the well casing, wall or pipe sleeve. Covers shall extend downward at least 2 inches over the outside of the well casing or wall.

A dug well cover shall be provided with a pipe sleeve which will permit the withdrawal of the pump suction pipe, cylinder or jet body without disturbing the cover.

Where pump suction or discharge pipes enter or leave a well through the side of the casing the circle of contact shall be watertight.

A.4.6 Drainage

All potable water wells and springs shall be constructed so that surface drainage will be diverted away from the well or spring.

A.5 PUMPING EQUIPMENT

Pumps shall be so constructed and installed as to prevent contamination from entering a potable water supply through the pump units. They shall be sealed to the well casing or cover with a watertight seal. Pumps shall be designed to maintain their prime and shall be so installed that pump parts or the entire assembly can be readily removed for repairs.

A.5.1 Pump Enclosure

Any pump room or enclosure about a well pump shall be positively drained and protected from freezing by heating or other approved means. Where pumps are installed in basements they shall be mounted on a block or shelf not less than 18 inches above the basement floor. Well pits are prohibited.

NOTE: For complete details on individual water supply construction and operation, see "Manual of Individual Water Supply Systems," Public Health Service Publication No. 24 (Revised 1962), U.S. Government Printing Office, Washington, D.C., 20402.

APPENDIX B

Individual Sewage-Disposal System

INTRODUCTION

The most satisfactory method of disposing of sewage is by connection to a public sewerage system. Every effort should be made to secure public sewer extensions. When connection to a public sewer is not feasible and when a considerable number of residences are to be served, consideration should be given to the construction of a community sewerage system and treatment plant. Specific information on this matter may be obtained from the local or state public health authorities having jurisdiction. In any event, such authority should be consulted prior to the installation of an individual sewerage-disposal system. Sewerage-disposal installations serving commercial establishments or more than one dwelling unit shall be designed in accordance with requirements of the Administrative Authority.

In those instances where the installation of a private sewerage-disposal system cannot be avoided, the following requirements shall be followed. These requirements are based on Public Health Service Publication No. 526, *Manual of Septic-Tank Practice*, and Addenda No. 1 and No. 2 dealing with Serial Distribution and Seepage Beds, respectively. This publication should be referred to by those installing individual sewage-disposal systems.

B.1 GENERAL

B.1.1 *Septic Tanks*

Septic tanks or other private means of disposal shall not be approved where a public sewer is available. Private sewage-disposal systems shall be discontinued when public sewers are made available, if such discontinuance is directed in their discretion by the legal authorities having jurisdiction.

B.1.2 *Design*

The design of the individual sewage-disposal system shall take into consideration location with respect to wells or other sources of water supply, topography, water table, soil characteristics, area available, and maximum occupancy of the building.

B.1.3 *Type of System*

The type of system to be installed shall be determined on the basis of location, soil permeability, and ground water elevation.

B.1.4 *Sanitary Sewage*

The system shall be designed to receive all sanitary sewage, including wastes from garbage grinders and automatic washing machines, from the building. Drainage from basement footings or from roofs shall not enter the system.

B.1.5 *Discharge*

The system shall consist of septic tanks discharging into either a subsurface disposal field which includes seepage trenches or seepage beds, or one or more seepage pits or into a combination of both, if found adequate as such and approved by the Administrative Authority.

B.1.6 *Alternate Design*

Where soil conditions are such that neither subsurface disposal fields or seepage pits mentioned in B.1.5 can be expected to operate satisfactorily, approval of an alternate design shall be secured from the Administrative Authority with concurrence of the proper health authorities having jurisdiction.

B.2 LOCATION

B.2.1 Distances

Table B.2.1., Location of Components of Sewage-Disposal System, provides for the minimum distances that shall be observed in locating the various components of the disposal system.

TABLE B.2.1—Location of components of sewage-disposal system

Type of system	Distance (feet)						
	Well or suction line	Water supply line (pressure)	Stream	Dwelling	Property line	Disposal field	Seepage pits
Building sewer	50	10					
Septic tank	50			5			
Disposal field	100		25	10	10		
Seepage pit	100		50	20	10	20	20
Dry well	50			10			
Cesspool ²	150		50	20	15	15	15

¹ When approved by the authority having jurisdiction and, under special soil conditions, this distance may be reduced. However, a minimum separation of not less than 50 feet shall be maintained.

² Not recommended as a substitute for a septic tank. To be used only when found necessary and approved by the Administrative Authority.

B.3 BUILDING SEWER

B.3.1 Size

The sewer shall be of a minimum size to serve the connected fixtures as determined from Chapter XI of the Code.

B.3.2 Slope

The sewer shall have a minimum slope as determined in Table 1100.2A, Maximum Loads for Horizontal Drains, of the Code, except that the slope of the sewer 10 feet preceding the tank connection shall not exceed one-quarter inch per foot.

B.4 SEPTIC TANK

B.4.1 Capacity

The septic tank shall have a minimum capacity in accordance with the provisions of Table B.4.1, Minimum Capacities for Septic Tanks Serving an Individual Dwelling.

TABLE B.4.1.—Minimum capacities for septic tanks serving an individual dwelling

No. of bedrooms	Nominal liquid capacity of tank (gals.)
2 or less	750
3	900
4	1,000

B.4.2 Multiple Compartments

In tanks having two compartments, the inlet compartment shall have a capacity of not less than one-half to two-thirds of the total tank capacity. Tanks built with three or four equal compartments shall have total liquid capacity required for a single compartment tank.

B.4.3 Construction

Septic tanks shall be constructed of corrosion-resistant materials and be of permanent construction. The cover of the tank shall be designed for a dead load of not less than 150 pounds per square foot and, if of concrete, should be reinforced and not less than 4 inches thick.

B.4.4 Manholes

The inlet and outlet of the septic tank shall be provided with manholes. All compartments in multiple compartmented tanks shall be provided with a manhole. Manholes shall be at least 20 inches square and provided with covers which can be sealed watertight. Manholes should be extended to within eight inches of the grade. Where removable slab covers are provided, manholes are not required.

B.4.5 Baffles

Where inlet and outlet baffles are used, they shall extend the full width of the tank and be located 6 to 8 inches from the end walls. Such baffles shall extend at least 6 inches above the flow line, and have a 1-inch minimum vent space above. Inlet baffles shall extend at least 6 inches below the flow line and outlet baffles should extend 40 percent of the liquid depth below the flow line.

B.4.6 Pipe Inlet and Outlet

In lieu of baffles, submerged pipe inlets and outlets may be installed consisting of a cast-iron sanitary T with a short section of pipe to the required depth as indicated in Section B.4.5.

B.4.7 Inlet Invert

The invert of the inlet pipe shall be located at least 3 inches above the invert of the outlet.

B.4.8 Dosing Chambers

Dosing chambers are not required in the case of individual disposal systems.

B.5 ABSORPTION AREAS

B.5.1 Individual Residences

The absorption areas for individual residences shall be determined from Table B.5.1, Absorption-Area Requirements for Individual Residences.

TABLE B.5.1.—Absorption-area requirements for individual residences¹

(Provides for garbage grinder and automatic washing machine)

Percolation rate (time required for water to fall 1 inch, in minutes)	Required absorption area, in sq. ft. per bedroom ² standard trench, ³ seepage beds ² and seepage pits ⁴	Percolation rate (time required for water to fall 1 inch, in minutes)	Required absorption area, in sq. ft. per bedroom ² standard trench, ³ seepage beds ² and seepage pits ⁴
1 or less	70	10	165
2	85	15	190
3	100	30 ⁵	250
4	115	45 ⁵	300
5	125	60 ^{5, 6}	350

¹ Desirable to provide sufficient additional area for entire new absorption area if need in the future.

² In every case, sufficient area should be provided for at least two bedrooms.

³ Absorption area is figured as trench-bottom area.

⁴ Absorption area for seepage pits is figured as effective sidewall area beneath the inlet.

⁵ Unsuitable for seepage pits if over 30.

⁶ Unsuitable for leaching systems if over 60.

B.6 PROCEDURE TO BE FOLLOWED FOR PERCOLATION TEST

B.6.1 Number and Location of Tests

Six or more tests shall be made in separate test holes spaced uniformly over the proposed absorption-field site to adequately determine the percolation rate. Tests shall not be made in frozen ground.

B.6.2 Type of Test Hole

Dig or bore a hole, with horizontal dimensions of from 4 to 12 inches and vertical sides to the depth of the proposed absorption trench. In order to save time, labor, and volume of water required per test, the holes can be bored with a 4-inch auger.

B.6.3 Preparation of Test Hole

Carefully scratch the bottom and sides of the hole with a knife blade or sharp pointed instrument, in order to remove any smeared soil surfaces and to provide a natural soil interface into which water may percolate. Remove all loose material from the hole. Add 2 inches of coarse sand or fine gravel to protect the bottom from scouring and sediment.

B.6.4 Saturation and Swelling of the Soil

It is important to distinguish between saturation and swelling. Saturation means that the void spaces between soil particles are full of water. This can be accomplished in a short period of time. Swelling

is caused by intrusion of water into the individual soil particle. This is a slow process, especially in clay-type soil, and is the reason for requiring a prolonged soaking period.

In conducting the test, carefully fill the hole with clear water to a minimum depth of 12 inches over the gravel. In most soils, it is necessary to refill the hole by supplying a surplus reservoir of water, possibly by means of an automatic siphon, to keep water in the hole for at least 4 hours and preferably overnight. Determine the percolation rate 24 hours after water is first added to the hole. This procedure is to insure that the soil is given ample opportunity to swell and to approach the condition it will be in during the wettest season of the year. Thus, the test will give comparable results in the same soil, whether made in a dry or in a wet season. In sandy soils containing little or no clay, the swelling procedure is not essential and the test may be made as described under Item B.6.5c, after the water from one filling of the hole has completely seeped away.

B.6.5 Percolation-Rate Measurement

With the exception of sandy soils, percolation-rate measurements shall be made on the day following the procedure described under Section B.6.4, above and according to the following:

- (a) If water remains in the test hole after the overnight swelling period, adjust the depth to approximately 6 inches over the gravel. From a fixed reference point, measure the drop in water level over a 30-minute period. This drop is used to calculate the percolation rate.
- (b) If no water remains in the hole after the overnight swelling period, add clear water to bring the depth of water in the hole approximately 6 inches over the gravel. From a fixed reference point, measure the drop in water level at approximately 30-minute intervals for 4 hours, refilling 6 inches over the gravel as necessary. The drop that occurs during the final 30-minute period is used to calculate the percolation rate. The drops during prior periods provide information for possible modification of the procedure to suit local circumstances.
- (c) In sandy soils (or other soils in which the first 6 inches of water seeps away in less than 30 minutes after the overnight swelling period), the time interval between measurements shall be taken as 10 minutes and the test run for 1 hour. The drop that occurs during the final 10 minutes is used to calculate the percolation rate.

B.7 MINIMUM STANDARDS FOR SOIL ABSORPTION SYSTEM CONSTRUCTION

B.7.1 Construction

The minimum standards for disposal field construction shall be as given in Table B.7.1, Minimum Standards for Absorption System Construction.

TABLE B.7.1.—Minimum standards for absorption system construction

	Trenches	Seepage beds
Individual lines, maximum length.....	100 feet.....	100 feet.....
Trench or bed bottom, minimum depth.....	18 inches.....	24 inches.....
Trench bottom, minimum width.....	12 inches.....	36 inches.....
Field tile, minimum diameter.....	4 inches.....	4 inches.....
Field tile lines, maximum slope.....	6 inches in 100 feet.....	Level grade.....
Trench or bed, minimum separation.....	6 feet.....	6 feet.....
Effective absorption area, minimum per dwelling unit.....	See Table B.5.1.....	See Table B.5.1.....

B.8 DISPOSAL TRENCHES AND SEEPAGE BEDS

B.8.1 Disposal Trenches

Disposal trenches and beds shall be designed and constructed on the basis of the required effective percolation area.

B.8.2 Filter Material

The filter material shall cover the tile and extend the full width of the trench or bed and be not less than 6 inches below the tile and 2 inches

above the tile. The filter material may be washed gravel, crushed stone, slag, or clean bankrun gravel ranging in size from $\frac{1}{2}$ to $2\frac{1}{2}$ inches. The filter material shall be covered by untreated paper or by a 2-inch layer of straw, hay, pine needles, or similar material as the laying of the tile drain proceeds.

B.8.3 Trench Disposal Field

The size and minimum spacing requirements for disposal fields shall conform to those given in Table B.8.3, Size and Spacing for Trench Disposal Systems.

TABLE B.8.3.—Size and spacing for trench disposal systems

Width of trench at bottom	Recommended depth of trench	Spacing tile lines ¹ center to center	Effective absorption area per lineal foot of trench
<i>Inches</i>	<i>Inches</i>	<i>Feet</i>	<i>Square feet</i>
18	18-30	6.0	1.5
24	18-30	6.0	2.0
30	18-36	7.6	2.5
36	24-36	9.0	3.0

¹ A greater spacing is desirable where available area permits.

B.8.4 Seepage Beds

Lines for distributing effluent shall be spaced not greater than 6 feet apart and not greater than 3 feet from the bed side-wall. Where more than one seepage bed is used there should be a minimum of 6 feet of undisturbed earth between adjacent beds which are connected in series.

B.8.5 Absorption Lines

Absorption lines shall be constructed of tile laid with open joints. In the case of bell-and-spigot tile, it should be laid with $\frac{1}{2}$ inch open joints, at 2-foot intervals with sufficient cement mortar at the bottom of the joint to insure an even flow line. In the case of agricultural tile, the sections shall be spaced not more than $\frac{1}{4}$ inch, and the upper half of the joint shall be protected by asphalt-treated paper. Perforated clay tile or perforated bituminized fiber pipe or asbestos cement pipe may be used, provided that sufficient openings are available for distribution of the effluent into the trench area.

B.9 SEEPAGE PIT

B.9.1 Seepage Pit

Seepage pits may be used either to supplement the subsurface disposal field or in lieu of such field where conditions favor the operation of seepage pits, as may be found necessary and approved by the Administrative Authority.

B.9.2 Water Table

Care shall be taken to avoid extending the seepage pit into the ground-water table. Where the pit is used to receive the septic tank effluent, the same limitations shall be placed on the location of the pit as on the cesspool. (See Section B.11.3.)

B.9.3 Pit Lining

Except as provided in paragraph B.9.6 the pit shall be lined with stone, brick, or concrete blocks laid up dry with open joints that are backed up with at least 3 inches of coarse gravel. The joints above the inlet shall be sealed with cement mortar. It is customary to draw in the upper section of the lining.

B.9.4 Pit Covers

A reinforced concrete cover shall be provided, preferably to within 8 inches of finished grade. If the cover is over 30 inches square, it shall have an access manhole or a sectional cover.

B.9.5 Bottom of Pit

The bottom of the pit shall be filled with coarse gravel to a depth of 1 foot.

B.9.6 Trees

When the seepage pit is located in close proximity to trees, it need not be lined as indicated in paragraph B.9.3; instead, it may be filled with loose rock.

B.9.7 Size of Pit

The seepage pit shall be sized in accordance with provisions in Table B.5.1, Absorption Area Requirements For Individual Residences.

B.10 DRY WELL

B.10.1 Dry Well Required

When necessary, a dry well shall be provided to receive the drainage from roofs, basements, or arcaways.

B.10.2 Size of Dry Well

Large dry wells shall be constructed in general accordance with the requirements given for seepage pits, Section B.9.

B.10.3 Small Dry Wells

For small dry wells handling limited quantities of water, the pit may consist of a 3-foot length of 18-inch diameter vitrified clay or cement pipe, filled with crushed rock or stone.

B.11 CESSPOOL

B.11.1 Use

The use of cesspools for disposal of sewage and their installation will be accepted only if no health hazard will result from such installation or use and if approval is obtained, before work is begun, from the Administrative Authority or the health department having jurisdiction.

B.11.2 Installations

Cesspool installations shall be considered only as a temporary expedient in those instances where connections to a public sewer system will be possible within a reasonable period of time.

B.11.3 Health Hazard

Because of the public health hazard involved, extreme care should be exercised in locating a cesspool. Under no circumstances shall the cesspool penetrate the ground-water stratum.

B.11.4 Construction

The construction of the cesspool shall comply with the requirements for seepage pits as given in Section B.9.

APPENDIX C

Hospital Plumbing

INTRODUCTION

This Appendix is designed to point out those items of the hospital plumbing system which differ from plumbing systems of other building types. Special care should be accorded the hospital plumbing system because of its direct relationship to the provision of adequate medical care and the need to protect hospital personnel and patients from health hazards involved in such systems.

It is understood that this hospital plumbing system shall conform not only to the criteria in this Appendix, but to the requirements contained in the body of the Code.

C.1 DEFINITIONS

C.1.1 Aspirator

An aspirator is a fitting or device supplied with water or other fluid under positive pressure which passes through an integral orifice or "constriction" causing a vacuum. Aspirators are often referred to as "suction" apparatus, and are similar in operation to an ejector.

C.1.2 Autopsy Table

An autopsy table is a fixture or table used for the postmortem examination of a body.

C.1.3 Bedpan Hopper (Clinic Sink)

A bedpan hopper is a fixture meeting the design requirements of Section C.2.1, sometimes called a clinic sink.

C.1.4 Bedpan Steamer

A bedpan steamer is a fixture used for scalding bedpans or urinals by direct application of steam.

C.1.5 Bedpan Washer

A bedpan washer is a fixture designed to wash bedpans and to flush the contents into the soil drainage system. It may also provide for steaming the utensils with steam or hot water.

C.1.6 Bedpan Washer Hose

A bedpan washer hose is a device supplied with hot and cold water and located adjacent to a water closet or clinic sink to be used for cleansing bedpans.

C.1.7 Clinic Sink

See Bedpan Hopper and Section C.2.1.

C.1.8 Flushing Type Floor Drain

A flushing type floor drain is a floor drain which is equipped with an integral water supply, enabling flushing of the drain receptor and trap.

C.1.9 Local Vent Stack

A local vent stack is a vertical pipe to which connections are made from the fixture side of traps and through which vapor and/or foul air may be removed from the fixture or device used on bedpan washers.

C.1.10 Sterilizer, Boiling Type

A boiling type "sterilizer" is a fixture (nonpressure type), used for boiling instruments, utensils, and/or other equipment (used for disinfection). Some devices are portable, others are connected to the plumbing system.

C.1.11 Sterilizer Instrument

See Sterilizer, Boiling Type.

C.1.12 Sterilizer, Pressure Instrument Washer-Sterilizer

A pressure instrument washer-sterilizer is a fixture (pressure vessel) designed to both wash and sterilize instruments during the operating cycle of the fixture.

C.1.13 Sterilizer, Pressure (Autoclave)

A pressure sterilizer is a fixture (pressure vessel) designed to use steam under pressure for sterilizing. Also called an Autoclave.

C.1.14 Sterilizer, Utensil

See Sterilizer, Boiling Type.

C.1.15 Sterilizer Vent

A sterilizer vent is a separate pipe or stack, indirectly connected to the building drainage system at the lower terminal, which receives the vapors from nonpressure sterilizers, or the exhaust vapors from pressure sterilizers, and conducts the vapors directly to the outer air. Sometimes called vapor, steam, atmospheric or exhaust vent.

C.1.16 Sterilizer, Water

A water sterilizer is a device for sterilizing water and storing sterile water.

C.1.17 Still

A still is a device used in distilling liquids.

C.2 FIXTURES

Acceptable flush rim bedpan hoppers (clinic sinks), bedpan washers, and/or other acceptable fixtures and equipment shall be provided for the disposing of bedpan contents and the cleansing and disinfection of bedpans in soiled utility (hopper) rooms.

C.2.1 Clinic Sink

A clinic sink shall have an integral trap in which the upper portion of a visible trap seal provides a water surface. The fixture shall be so designed as to permit complete removal of the contents by siphonic and/or blowout action, and to reseal the trap. A flushing rim shall provide water to cleanse the interior surface. The fixtures shall have flushing and cleansing characteristics similar to a water closet.

C.2.2 Prohibited Use of Clinic Sinks and Service Sinks

A clinic sink serving a soiled utility room shall not be considered as a substitute for, nor shall it be used as a janitor's service sink. A janitor's service sink shall not be used for the disposal of urine, fecal matter, or other human wastes.

C.2.3 Ice Prohibited in Soiled Utility Rooms

No machine for manufacturing ice, or any device for the handling or storage of ice shall be located in a soiled utility room. Machines for manufacturing ice, or devices for handling or storage of ice intended for either human consumption or packs, may be located in clean utility room, floor pantry, or diet kitchen.

C.2.4 Sterilizer Equipment Requirements

- a. Descaling of Equipment Prohibited: It shall be unlawful to descale or otherwise submit the interior of water sterilizers, stills, or similar equipment to acid or other chemical solutions while the equipment is connected to the water and/or drainage system.
- b. ASME Standard: New pressure sterilizers and pressure instrument washer-sterilizers hereafter installed, shall display in a location to be clearly visible at all times, the ASME Standard symbol and data plate.
- c. Sterilizer Piping: All sterilizer piping and/or devices necessary for the operation of sterilizers shall be accessible for inspection and maintenance.
 - (1) Steam Supply: Steam supplies to sterilizers, including those connected by pipes from overhead mains or branches, shall be drained to prevent any excess moisture from reaching the

sterilizer. The condensate drainage from the steam supply shall be discharged by gravity.

(2) **Steam Condensate Return:** Steam condensate return from sterilizers shall not be connected to pressure or vacuum return systems; only gravity returns shall be acceptable. Steam condensate returns from sterilizers shall not be connected to overhead mains or branches.

(3) **Condensers:** Pressure sterilizers should be equipped with an acceptable means of condensing and cooling the exhaust steam vapors.

Nonpressure sterilizers should be equipped with an acceptable device which will automatically control the vapors in a manner to confine them within the vessel, or equipped with an acceptable means of condensing and cooling of vapors.

(4) **Gas Fired Equipment:** Gas fired equipment or apparatus requiring either water or drainage connections or both, shall meet the Standards of the American Gas Association.

C.2.6 Special Elevations

Control valves, vacuum outlets, and devices which protrude from a wall of an operating, emergency, recovery, examining, or delivery room, or a corridor and/or other locations where patients may be transported on a wheeled stretcher, shall be so located at an elevation which will preclude bumping the patient or stretcher against the device. When necessary to install at a low elevation, safety precautions should be taken to protect the personnel.

C.2.7 Plumbing in Mental Hospitals

In mental hospitals, special consideration should be given to piping, controls, and fittings of plumbing fixtures as required by the types of mental patients being treated. No pipes or traps should be exposed and fixtures should be substantially bolted through walls.

NOTE: Those fixtures not covered in this Appendix having to do with hospital plumbing will be covered in Table 701.1, Minimum Number of Plumbing Fixtures.

C.3 DRAINAGE AND VENTING

C.3.1 Ice Storage Chest Drains

Any drain serving an ice chest or box shall discharge over an indirect waste receptor separate from all other fixture wastes. Each terminal shall discharge through an air gap above the receptor. The end shall be covered with a removable screen of not less than ten mesh per inch, and if discharging vertically, the terminal shall be cut at an angle of 45 degrees.

C.3.2 Bedpan Washers and Clinic Sinks

Bedpan washers and clinic sinks shall be connected to the soil pipe system and vented following the requirements as applied to water closets except that bedpan washers require additional local vents. See Section C.3.12a.

C.3.3 Sterilizer Wastes

- a. **Indirect Wastes Required:** All sterilizers shall be provided with individual and separate indirect wastes, with air gaps of not less than two (2) diameters of the waste tailpiece. The upper rim of the receptor, funnel, or basket type waste fitting shall be not less than two inches (2") below the vessel or piping, whichever is lower. Except as provided in Sections C.3.3c and C.3.3e a "P" trap shall be installed on the discharge side of and immediately below the indirect waste connection serving each sterilizer.
- b. **Floor Drain Required:** In all recess rooms containing the recessed, or concealed portions of sterilizers, not less than one acceptable floor drain, connecting to the drainage system, shall be installed in a manner to drain the entire floor area.
- c. **Recess Room Floor Drains, Trap Seal Maintenance:** The recess room floor drain waste and trap shall be a minimum diameter of 3 inches. It shall receive the drainage from at least one sterilizer within the recess room to assure maintenance of the floor drain trap seal. The sterilizer drain shall be installed on a branch taken off

between the floor drain trap and the drain head. No individual sterilizer waste trap shall be required on this type of installation.

- d. **Prohibited Connections:** Branch funnel and branch basket type fittings, except as provided in Section C.3.3e are prohibited on any new installation or when relocating existing equipment. Existing branch funnel or branch basket type installations shall be provided with an acceptable indirect waste below the branch connections.
- e. **Battery Assemblies:** A battery assembly of not more than three sterilizer wastes may drain to one trap, provided the trap and waste are sized according to the combined fixture unit rating; the trap is located immediately below one of the indirect waste connections; the developed distance of a branch does not exceed 8 feet; and the branches change direction through a tee-wye or wye pattern fitting.
- f. **Bedpan Steamers, Additional Trap Required:** A trap with a minimum seal of 3 inches shall be provided in a bedpan steamer drain located between the fixture and the indirect waste connection.
- g. **Pressure Sterilizer:** Except when an exhaust condenser is used a pressure sterilizer chamber drain may be connected to the exhaust drip tube before terminating at the indirect waste connection. If a vapor trap is used, it shall be designed and installed to prevent moisture being aspirated into the sterilizer chamber. The jacket steam condensate return, if not connected to a gravity steam condensate return, shall be separately and indirectly wasted. If necessary to cool a high temperature discharge, a cooling receiver, trapped on its discharge side, may serve as the fixture trap.
- h. **Pressure Sterilizer Exhaust Condensers:** The drain from the condenser shall be installed with an indirect waste as prescribed in the Code. If condensers are used on pressure sterilizers, the chamber drain shall have a separate indirect waste connection.
- i. **Water Sterilizer:** All water sterilizer drains, including tank, valve leakage, condenser, filter and cooling, shall be installed with indirect waste or according to Section C.3.3(b).
- j. **Pressure Instrument Washer-Sterilizer:** The pressure instrument washer-sterilizer chamber drain and overflow may be interconnected. Also, they may be interconnected with the condenser. The indirect waste shall follow the provision set forth in the Code.

C.3.4 *Aspirators*

In operating rooms, emergency rooms, recovery rooms, delivery rooms, examining rooms, autopsy rooms, and other locations except laboratories where aspirators are installed for removing blood, pus, and/or other fluids, the discharge from any aspirator shall be indirectly connected to the drainage system. The suction line shall be provided with a bottle or similar trap to protect the water supply.

C.3.5 *Vacuum System Stations*

Vacuum system stations location shall be considered from the standpoint of convenience and practical use. The receptacles should be built into cabinets or recesses but shall be visible and readily accessible.

C.3.6 *Bottle Systems*

Vacuum (fluid suction) systems intended for collecting, removing and/or disposing of blood, pus, and/or other fluids by the so-called bottle system shall be provided with receptacles which are equipped with an overflow preventive device, at each vacuum outlet station. Each vacuum outlet station should be equipped with a secondary safety receptacle as an additional safeguard against fluids, other than air, entering the vacuum piping systems.

C.3.7 *Central Disposal System Equipment*

Because of the dependence placed upon central vacuum (fluid suction) systems, all such systems shall assure continuous service. Systems equipped with collecting and/or control tanks shall provide for the draining and cleaning of the tanks while the system is in operation. In hospitals or like institutions having emergency power provisions, the system shall be capable of remaining in service during the use of emergency power. The exhausts from a vacuum pump used in con-

nection with a vacuum (fluid suction) system shall discharge separately to the outer atmosphere above the roof. The exhaust discharge shall not create a nuisance and/or hazard within, without, around, and/or about the premises.

C.3.8 Central Vacuum and/or Disposal Systems

- a. Wastes: The waste from a central vacuum (fluid suction) system of the disposal type and/or which is connected to the drainage system whether the disposal be by barometric leg, collecting tanks, or bottles, shall be directly connected to the sanitary drainage system through a trapped waste.
- b. Piping: The piping of a central vacuum (fluid suction) system shall be of corrosion resistant material having a smooth interior surface. No branch shall be less than $\frac{1}{2}$ inch for one outlet and sized according to the number of vacuum outlets, and no main shall be less than 1 inch. The pipe sizing shall be increased according to the manufacturer's recommendation as stations are increased. All piping shall be provided with adequate and accessible clean-out facilities on mains and branches, and shall be accessible for inspection, maintenance, and replacements.

C.3.9 Water Systems for Space Cooling and Heating Condensate Drains

The lowest point of a condensate riser or risers shall be trapped and discharged over an indirect waste sink. The trap may be either "P" or a "running trap" with a cleanout. A branch shall be installed upstream from the condensate drain trap for flushing and resealing purposes. The condensate drain and trap shall be located above the lowest floor level of the building.

C.3.10 Vent Material

Material for local vents serving bedpan washers and sterilizer vents serving sterilizers, shall be sufficiently rust proof, erosion and corrosion resistant to withstand intermittent wetting and drying from steam vapors, to withstand the distilled water solvent action of the steam vapors and to withstand frequent and immediate changes of temperatures.

C.3.11 Vent Connections Prohibited

Connections between local vents serving bedpan washers, sterilizer vents serving sterilizing apparatus, and/or normal sanitary plumbing systems, are prohibited. Furthermore, only one type of apparatus shall be served by a given vent.

C.3.12 Local Vents and Stacks

- a. Bedpan Washers: Bedpan washers shall be vented to the outer atmosphere above the roof by means of one or more local vents. The local vent for a bedpan washer shall be not less than a 2-inch diameter pipe. A local vent serving a single bedpan washer may drain to the fixture served.
- b. Multiple Installations: Where bedpan washers are located above each other on more than one floor, a local vent stack may be installed to receive the local vent on the various floors. Not more than 3 bedpan washers shall be connected to a 2-inch local vent stack, 6 to a 3-inch local vent stack, and 12 to a 4-inch local vent stack. In multiple installations, the connections between a bedpan washer local vent and a local vent stack shall be made by use of the tee or tee-wye sanitary pattern drainage fittings, installed in an upright position.
- c. Trap Required: The bottom of the local vent stack, except when serving only one bedpan washer, shall be drained by means of a trapped and vented waste connection to the plumbing sanitary drainage system. The trap and waste shall be the same size as the local vent stack.
- d. Trap Seal Maintenance: A water supply of not less than one-quarter inch minimum tubing shall be taken from the flush supply of each bedpan washer on the discharge or fixture side of the vacuum breaker, trapped to form not less than a 3-inch seal, and connected to the local vent stack on each floor. The water supply shall be so installed as to provide a supply of water to the local vent stack for cleansing and drain trap seal maintenance each time a bedpan washer is flushed.

C.3.13 Sterilizer Vents and Stacks

- a. Connections: Multiple installations of pressure and nonpressure sterilizers shall have their vent connections to the sterilizer vent stack made by means of inverted wye fittings. Such vent connections shall be accessible for inspection and maintenance.
- b. Drainage: The connection between sterilizer vent and/or exhaust openings and the sterilizer vent stack shall be designed and installed to drain to the funnel or basket-type waste fitting. In multiple installations, the sterilizer vent stack shall be drained separately to the lowest sterilizer funnel or basket-type waste fitting or receptor.

C.3.14 Sterilizer Vent Stack Sizes

- a. Bedpan Steamers: The minimum size of a sterilizer vent serving a bedpan steamer shall be one and one-half inches in diameter. Multiple installations shall be sized according to Table C.3.14a, Stack Sizes for Bedpan Steamers and Boiling Type Sterilizers.

TABLE C.3.14a.—Stack sizes for bedpan steamers and boiling type sterilizers

(Number of connections of various sizes permitted to various sized sterilizer vent stacks)

Stack size	Connection size	
	1½"	2"
1½-inch 1	1 or 0	0
2-inch 1	2 or 1	1
2-inch 2	1 and 1	1
3-inch 1	4 or 2	2
3-inch 2	2 and 2	2
4-inch 1	8 or 4	4
4-inch 2	4 and 4	4

¹ Total of each size.

² Combination of sizes.

- b. Boiling Type Sterilizers: The minimum size of a sterilizer vent stack shall be 2 inches in diameter when serving a utensil sterilizer, and 1½ inches in diameter when serving an instrument sterilizer. Combinations of boiling type sterilizer vent connections shall be based on Table C.3.14a, Stack Sizes for Bedpan Steamers and Boiling Type Sterilizers.
- c. Pressure Sterilizers: Sterilizer vent stacks shall be two and one-half inches minimum; those serving combinations of pressure sterilizer exhaust connections shall be sized according to Table C.3.14b, Stack Sizes for Pressure Sterilizers.
- d. Pressure Instrument Washer-Sterilizer Sizes: The minimum size of a sterilizer vent stack serving an instrument washer-sterilizer, shall be 2 inches in diameter. Not more than two sterilizers shall be installed on a 2-inch stack, and not more than four on a 3-inch stack.

TABLE C.3.14b.—Stack sizes for pressure sterilizers

(Number of connections of various sizes permitted to various sized vent stacks)

Stack size	Connection size			
	¾"	1"	1¼"	1½"
1½-inch 1	3 or 2 or 1			
1½-inch 2	2 and 1			
2-inch 1	6 or 3 or 2 or 1			
2-inch 2	3 and 2			
2-inch 3	2 and 1 and 1			
3-inch 1	1 and 1 and 1			
3-inch 2	15 or 7 or 5 or 3			
3-inch 3	1 and 1 and 2 and 2			
3-inch 4	1 and 5 and 1			

¹ Combination of sizes.

² Total of each size.

C.3.15 *Radioactive Materials*

All radioactive materials shall be disposed of in a manner so as to create no hazard to operation and maintenance personnel of the institution or to the public. Specific permission shall be secured from the Administrative Authority to dispose of any radioactive material to the drainage system.

C.4 WATER SUPPLY

C.4.1 *Water Service*

All hospitals shall have dual services installed in a manner to provide an uninterrupted supply of water in case of a water main break.

C.4.2 *Hot Water Heater and Tanks*

The hot water heating equipment shall have sufficient capacity to supply 6½ gallons of water at 125° F. per hour per bed for hospital fixtures; 4 gallons of water at 180° F. per hour per bed for kitchens; and 4½ gallons of water at 180° F. per hour per bed for laundry. The hot water storage tank or tanks shall have a capacity equal to 80 percent of the heater capacity. Where direct fired hot water heaters are used, they shall be of an approved high pressure type. Submerged steam heating coils should be of copper. Storage tanks shall be fabricated of noncorrosive metal or be lined with noncorrosive metal.

C.4.3 *Hot Water Supply System*

Hot water circulating mains and risers should be run from the hot water storage tank to a point directly below the highest fixture at the end of each branch main. Where the building is higher than three stories, each riser shall be circulated. Each main, branch main, riser and branch to a group of fixtures of the water system shall be valved.

C.4.4 *Vacuum Breaker Installations*

- a. *Hose Connections:* For ordinary hose connections the maximum height at which any hose is to be used shall be treated as its flood level.
- b. *Low Volume Flows:* Where low volume flows might cause leaking or spitting at the vacuum breaker parts, back pressure may be developed by installing an acceptable minimum orifice valve on the discharge side of the vacuum breaker. This shall be in addition to the regular control valve. This type of installation shall be subject to review and acceptance by the Administrative Authority before installation.

C.4.5 *Prohibited Water Closet and Clinic Sink Supply*

No jet or water supplied orifices, except those supplied by the flush connection, shall be located in and/or connected with a water closet bowl or clinic sink. This section shall not prohibit an acceptable bidet installation.

C.4.6 *Special Equipment, Water Supply Protection*

The Table C.4.6, Fixtures and Their Water Supply Protection, sets forth the requirements which shall be followed in protecting the water supply for hospital fixtures against backflow or back-siphonage.

TABLE C.4.6.—Fixtures and their water supply protection

Fixtures	Type of protection ¹	Remarks
Aspirators:		
Laboratory.....	Vacuum breaker.....	
Portable.....	Vacuum breaker.....	
Vacuum system.....	Vacuum breaker.....	
Bedpan:		
Washers.....	Vacuum breaker.....	
Washer hose.....	Vacuum breaker.....	
Boiling type sterilizer.....	Air gap.....	Locate 5 feet above floor. Not less than twice the effective opening of the water supply.
Exhaust condenser.....	Vacuum breaker.....	
Flush floor drain.....	Vacuum breaker.....	
Hose connection.....	Vacuum breaker.....	
Pressure instrument washer-sterilizer.....	Vacuum breaker.....	Locate 6 feet above floor.
Pressure sterilizer.....	Vacuum breaker.....	
Vacuum systems:		
Cleaning.....	Air gap or vacuum breaker.....	
Fluid suction.....	Air gap or vacuum breaker.....	

¹ Where vacuum breakers are used, they shall be installed after the last control valve.

C.4.7 Clinical, Hydrotherapeutic and Radiological Equipment

All clinical, hydrotherapeutic, radiological, or any equipment, whether mentioned or not, which is water supplied and/or discharges to the waste system, shall meet the requirements of this Appendix and the Code covering cross-connections, air gaps, vacuum breakers, and check valves.

Special equipment and devices found under these classes include:

Clinical	Hydrotherapeutic	Radiological	Other
Dental cuspidors.	Control units		Violet ray
Surgical cuspidors	Arm bath	Diagnostic X-ray	
Dental (flush rim) lavatories	Leg bath	Therapy X-ray	
Colonic irrigation	Foot bath	X-ray target	
Sitz bath	Tub bath	X-ray transformers	
Emergency bath	Immersion bath	X-ray oil tank	
Receiving bath	Shower bath	Diffraction	
Prenatal bath	Needle bath		
Infant bath	Tank	X-ray developing	
Prophylaxis	Pool		Photographic developing
Shampoo	Hose		Film developing
Massage	Syringe		
	Douche		Microscopic

C.4.8 Condensate Drain Trap Seal

A water supply shall be provided for cleaning, flushing, and resealing the condensate trap. The source of the water supply shall be a refrigerator condenser discharge, a drinking fountain waste, or other acceptable method of flushing and resealing the trap. The water supply shall be not less than ½ inch diameter pipe, and shall discharge through an air gap not less than twice the diameter of the supply pipe.

C.4.9 Valve Leakage Diverter

Each water sterilizer which may be filled with water through directly connected piping, shall be equipped with an acceptable leakage diverter and/or bleed-line on the water supply control valve to indicate and conduct any leakage of unsterile water away from the sterile zone.

C.4.10 *Water Supply for Fire Protection*

- a. **Stand Pipe System:** The stand pipe system shall be installed as required by the Administrative Authority. Where no codes are in force, the stand pipe system should comply with the requirements of the National Board of Fire Underwriters, Pamphlet #14.
- b. **Sprinkler System:** Automatic sprinkler systems shall be installed in those areas considered hazardous from a fire safety point of view. Such hazardous areas may include the soiled linen rooms, basement corridors, paint shops, woodworking shops, trash rooms, storage rooms, accessible attics, laundry and trash chutes. Sprinkler systems should comply with the requirements of the National Board of Fire Underwriters, Pamphlet #15.

C.5 OXYGEN SYSTEMS

Where oxygen systems are installed, the oxygen piping, outlets, manifolds, manifold rooms and storage rooms should be installed in accordance with the requirements of the National Fire Protection Association Bulletins #56 and #565.

APPENDIX D

Sizing the Building Water Supply Distribution System

D.1 GENERAL

The following sections outline a procedure for the sizing of the water supply piping. The design procedure is based on the minimum pressure available from the street main or individual source of supply, the head changes in the system due to friction and elevation, the volume rates of flow required for satisfactory operation of the fixtures, and the probability of simultaneous use.

D.2 TOTAL DAILY WATER REQUIREMENTS

D.2.1 Basic Needs

The calculation of total daily requirements for water may be based on the unit quantities shown in Tables D.2.1, Design Criteria for Daily Water Requirements Based on Building Occupancy, and D.2.1a, Daily Water Requirements for Common Farm Animals. The total daily water requirement does not constitute the *peak or simultaneous* water requirement of the supply and shall not be used in sizing water distribution systems. The total of the daily water requirement shall be used only to determine whether the source of the water supply is sufficient to provide the water requirements of people, animals, irrigation, and other water using facilities served. The rate of flow and pressures at which the total daily water requirements shall be delivered shall be determined as prescribed herein after.

TABLE D.2.1.—Design criteria for daily water requirements based on building occupancy

Type of occupancy	Minimum quantity of water per person per day in gallons (or as indicated)
Small dwellings and cottages with seasonal occupancy	50
Single family dwellings	75
Multiple family dwellings (apartments)	60
Rooming houses	40
Boarding houses	50
Additional kitchen usage for nonresident boarders	10
Hotels without private baths	50
Hotels with private baths (2 persons per room)	60
Restaurants (toilet and kitchen usage per patron)	7 to 10
Restaurants (kitchen usage per meal served)	2½ to 3
Additional for bars and cocktail lounges	2
Tourist camps or trailer parks with central bathhouse	35
Tourist camps or mobile home parks with individual bath units	50
Resort camps (night and day) with limited plumbing	50
Luxury camps	100 to 150
Work or construction camps (semipermanent)	50
Camp (with complete plumbing)	45 (Ind.w.s.)
Camp (with flush toilets—no showers)	25 (Ind.w.s.)
Day Camps (no meals served)	15
Day Schools, without cafeterias, gymnasiums, or showers	15
Day Schools with cafeterias, but no gymnasiums or showers	20
Day Schools with cafeterias, gymnasiums and showers	25
Boarding Schools	75 to 100

TABLE D.2.1.—Design criteria for daily water requirements based on building occupancy—Continued

Type of occupancy	Minimum quantity of water per person per day in gallons (or as indicated)
Day workers at schools and offices (per shift)	15
Hospitals (per bed)	150 to 250
Institutions other than hospitals (per bed)	75 to 125
Factories (gallons per person per shift, exclusive of industrial wastes)	15 to 35
Picnic parts (toilet usage only) (gallons per picnicker)	5
Picnic parks with bathhouses, showers and flush toilets	10
Swimming pools and bathhouses	10
Luxury residences and estates	100 to 150
Country clubs (per resident member)	100
Country clubs (per nonresident member)	25
Motels (per bed space)	40
Motels with bath, toilet, and kitchen range	50
Drive-in theaters (per car space)	5
Movie theaters (per auditorium seat)	5
Airports (per passenger)	3 to 5
Self-service laundries (gallons per wash, i.e., per customer)	50
Stores (per toilet room)	400
Service stations (per vehicle serviced)	10

TABLE D.2.1A.—Daily water requirements for common farm animals

Animal	Minimum daily water requirements in gallons
Horse, mule, or steer	12
Dairy cow (drinking only)	15
Dairy cow (drinking and dairy servicing)	35
Sheep	2
Hog	4
Chickens (100)	4
Turkeys (100)	4

D.2.2 Calculating Total Daily Requirement

Total daily water requirements should be calculated by multiplying the unit daily requirement by the total number of persons in the occupancy involved. See Example (1). To this figure must be added any special use quantity, such as lawn watering, industrial requirement, etc.

D.2.3 Special Requirements

The total daily amount of any special requirement shall be added to the figure as obtained under section D.2.2 Table 1002.7, Rate of Flow and Required Pressure During Flow for the Following Plumbing Fixtures, gives special use quantities for some conditions. While the quantity of special use water shall be computed on the rates given in Table 1002.7, the total amount shall be figured for appropriate periods and conditions of use. See Example (2).

- (1) Example: Assume there is a hospital outside the limits of a community. The hospital has 300 beds. In addition, the hospital supplies its own dairy products and has a farm with 40 head of cattle. In Table D.2.1, the daily water requirement per hospital bed is taken as 250 gallons per bed. From Table D.2.1A, the water requirement per head of cattle is taken as 35 gallons per animal. Therefore the total daily water requirement is 300×250 plus 40×35 or 76,400 gallons.
- (2) Example: It is assumed that at the hospital cited in D.2.1 there is a lawn sprinkling system operating from 12 sillcocks 3 hours each day. From Table 1002.7 it is seen that each sillcock requires 300 gallons per hour. Therefore, the total special use water will equal $12 \times 300 \times 3$ or 10,800 gallons. This amount is added to that obtained in Example (1). The total quantity required is, therefore, 76,400 plus 10,800 or 87,200 gallons per day.

D.3 DETERMINATION OF PEAK DEMAND

D.3.1 Estimating Water Supply Demand

In determining the size of water supply distribution piping the maximum momentary volume rate of flow of water shall first be determined. This is the supply demand which is based on the numbers and kinds of fixtures installed, on the rates of flow required by the different kinds of fixtures, and on the probable simultaneous operation of the various fixtures. The total daily requirements do not enter into this determination.

In computing supply demand, use shall be made of Table D.3.1, Supply Fixture Unit Values for Various Plumbing Fixtures.

TABLE D.3.1.—Supply fixture unit values for various plumbing fixtures

Fixture or group ¹	Type of supply control	Supply fixture unit values		
		Hot	Cold	Total ²
Bathroom group	Flush valve	3	6	8
Bathroom group	Flush tank	3	4.5	6
Bathtub	Faucet	1.5	1.5	2
Combination fixture	Faucet	2	2	3
Kitchen sink	Faucet	1.5	1.5	2
Laundry tray	Faucet	2	2	3
Lavatory	Faucet	1.5	1.5	2
Pedestal urinal	Flush valve	3	10	10
Service sink	Faucet	1.5	1.5	2
Shower head	Faucet	3	3	4
Stall or wall urinal	Mixing valve	1.5	1.5	2
Stall or wall urinal	Flush valve	3	3	4
Water closet	Flush tank	5	5	5
Water closet	Flush valve	10	10	10
Water closet	Flush tank	5	5	5

¹ For fixtures not listed, factors may be assumed by comparing the fixture to a listed one using water in similar quantities and at similar rates.

² For fixtures with both hot and cold water supplies, the weights for maximum separate demands may be taken as $\frac{1}{2}$ of the total supply fixture unit value.

D.3.2 Calculation of Demand

When the water supply fixture units are used to estimate the supply demand, the supply fixture unit values as given in Table D.3.1 shall be used in conjunction with Table D.3.2B*, Supply Demand for Various Loads in Supply Fixture Units.

*NOTE: Figure D.3.2 is a graphical representative of Table D.3.2.

TABLE D.3.2.—Supply demand for various loads in supply fixture units

Load	Supply demand		Load	Supply demand	
	Flush valve water closets predominate (curve 1)	Tank water closets predominate (curve 2)		Flush valve water closets predominate (curve 1)	Tank water closets predominate (curve 2)
Supply fixture units:	gpm	gpm	Supply fixture units:	gpm	gpm
5	22	4	500	143	124
10	27	8	600	157	143
20	35	14	700	162	152
30	42	20	800	170	161
40	46	24	850	183	178
50	51	28	900	189	185
60	54	32	1,000	197	195
88	64	40	1,050	208	208
124	74	48	1,100	216	216
160	81	56	1,200	243	243
236	98	72	1,510	270	270
300	108	85	2,480	324	324
400	127	106	2,900	378	378
470	135	118		432	432

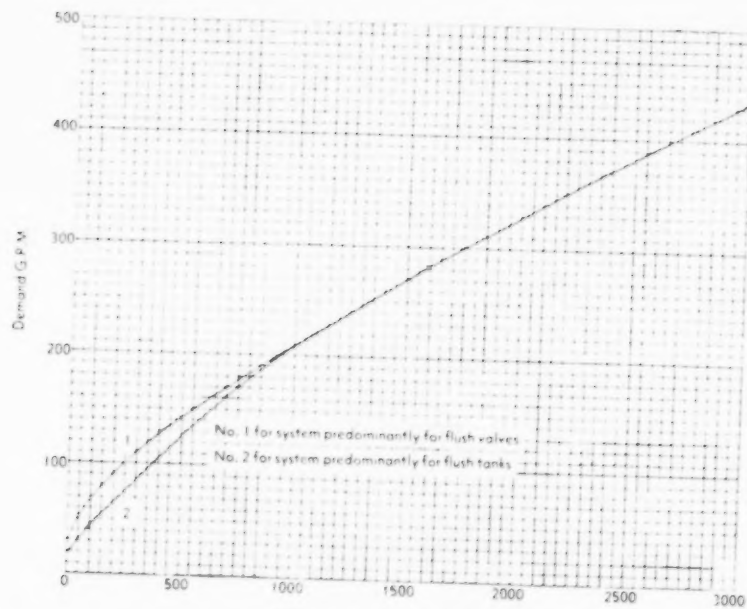
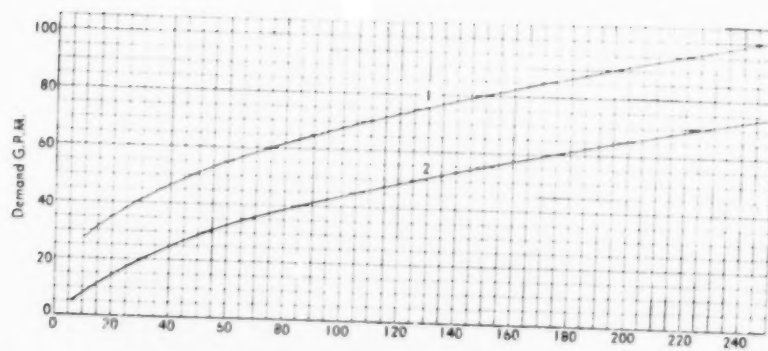


Figure D.3.2.B—Supply Fixture Units



Supply Fixture Units—Section of Figure D.3.2.B Enlarged

The estimated demand load in gallons per minute for fixtures used intermittently on any water supply pipe shall be obtained by multiplying the total number of each kind of fixture, supplied through that pipe by its Supply Fixture Unit Value from Table D.3.1, adding the products, and then, referring to the appropriate columns of Table D.3.2, or using the Figure, select the Demand in GPM. Examples are given below.

The additional load of any continuously flowing outlets such as hose outlets shall be computed separately and added to the total demand of intermittently used fixtures. See Example (2) below.

- (1) Assume a water line serving a public washroom in which are three flushometer pedestal urinals, six flushometer closets and six lavatories with hot and cold water. First prepare a tabulation as shown.

Name of plumbing fixture	Number on system (or section) ¹	Supply fixture unit value per fixture (Table D.3.1)			Total supply fixture units		
		Hot	Cold	Total	Hot	Cold	Total
Pedestal Urinal, Flush Valve	3		10	10		30	30
Flushometer Closet	6		10	10		60	60
Lavatory	6	1.5	1.5	2	9	9	12
Total					9	99	102
Supply demand in GPM					7	67	68

¹ See paragraph D.3.3.

Referring to Table D.3.1 for these fixtures, it is found that the total demand in supply fixture units for hot was 9 s.f.u., for cold was 99 s.f.u., and for a total demand of 102 s.f.u. By using Figure D.3.2 curve number 2 it is determined that the supply demand in GPM for hot water is 7 and by using the same figure but curve 1 it is determined that the demand for cold water in GPM is 67 and the total demand in GPM is 68. This breakdown is used in order to size the hot water supply branch, the cold water supply branch and the building service line.

- (2) Assume an apartment building (private type occupancy) having 200 bathroom groups with flushometer closets and 200 kitchen sinks. The apartment lawn has installed in it a sprinkler system operating from (7) sillcocks. What is the demand flow for which the water service to the apartment must be designed? The intermittent use fixtures are figured as in Example (1) to have a demand of 326 GPM.

Name of fixture	Number on system	Supply fixture unit value per fixture (Table D.3.1)			Total supply fixture units		
		Hot	Cold	Total	Hot	Cold	Total
Bathroom group	200	3	6	8	600	1,200	1,800
Kitchen sink	200	1.5	1.5	2	300	300	600
Total					900	1,500	2,400
Demand in GPM (Figure D.3.2)					208	270	326

The lawn sprinkler system outlets have a demand of 5 GPM each (Table 1002.7). The total sprinkler system demand is, therefore, 35 GPM. This is added to the total demand (326) of the intermittently used fixtures making a total water demand of 361 GPM. This total figure would then be used to determine the size of the building service pipe. The 35 GPM demand figure would also be added to the cold water demand figure of 270 giving total cold water demand of 305 GPM and this figure would be used in sizing the cold water distribution piping.

D.3.3 Selection of Pipe Size

Pipe sizes may be selected according to the following water pipe sizing procedure except that in no case shall a pipe size be less than shown in Table 1002.1, nor in the case of water service lines, less than specified in Section 1001.1.

- a. The water pipe sizing procedure is based on a system of pressure requirements and losses, the sum of which must not exceed the minimum pressure available at the street main or other source of supply.

These pressures are expressed as follows:

- (1) *Pressure required at fixture to produce adequate flow*—See Table 1002.7.
- (2) *Static Pressure loss*—This is computed at 0.43 p.s.i. per ft. of pipe rise or drop and is added or subtracted respectively.
- (3) *Loss through water meter*—Pressure or friction losses for various size meters are shown in Table or Figure D.3.3A.
- (4) *Loss through taps in water main*—Losses for various size taps are shown in Table D.3.3C.
- (5) *Losses through special devices such as filters, water softeners, backflow preventers, etc.*—These must be obtained from the manufacturer, or estimated and added to the total.
- (6) *Loss through fittings and valves*—Losses for these devices are computed by converting the fittings or valves to equivalent straight sections of pipe and adding this length to the total for the pipe section being considered. Table D.3.3B shows equivalent lengths of pipe for fittings and valves.
- (7) *Loss due to pipe friction*—This loss may be readily computed when (A) the pipe size, (B) its length and (C) the flow through the pipe are known. When these three factors are known the friction loss can be determined from either Table D.3.3 D, G or the figures D.3.3 D, E, F, G. The table and the figure used depends on the type of pipe used. An example of this sizing procedure is given in the following section.

TABLE D.3.3A.—Loss of pressure through disk-type meters in pounds per square inch (p.s.i.)

Gallons per minute	Size of meter							
	1/8 in.	1/4 in.	1 in.	1 1/2 in.	2 in.	3 in.	4 in.	6 in.
4	1.0							
5	1.6							
6	2.2							
7	3.0	1.1						
8	4.0	1.4						
9	5.0	1.7						
10	6.1	2.1						
15	14	5.0						
20		8.8	2.0					
30		19	8.0	1.0				
40			14	4.0	1.6			
50			22	6.2	2.4			
60				9.0	3.6			
80				12	4.9	1.3		
90				16	6.2	1.7		
100				20	8.0	2.0		
120					10	2.5	1.0	
140					14	3.7	1.3	
160					20	5.1	2.0	
180						6.2	2.4	
200						8.1	3.3	
250						10	4.0	1.0
300						16	6.1	1.7
350						23	9.0	2.3
400							13.0	3.0
500							16.0	4.0
600							25.0	6.1
700								9.0
800								13
900								16
								20

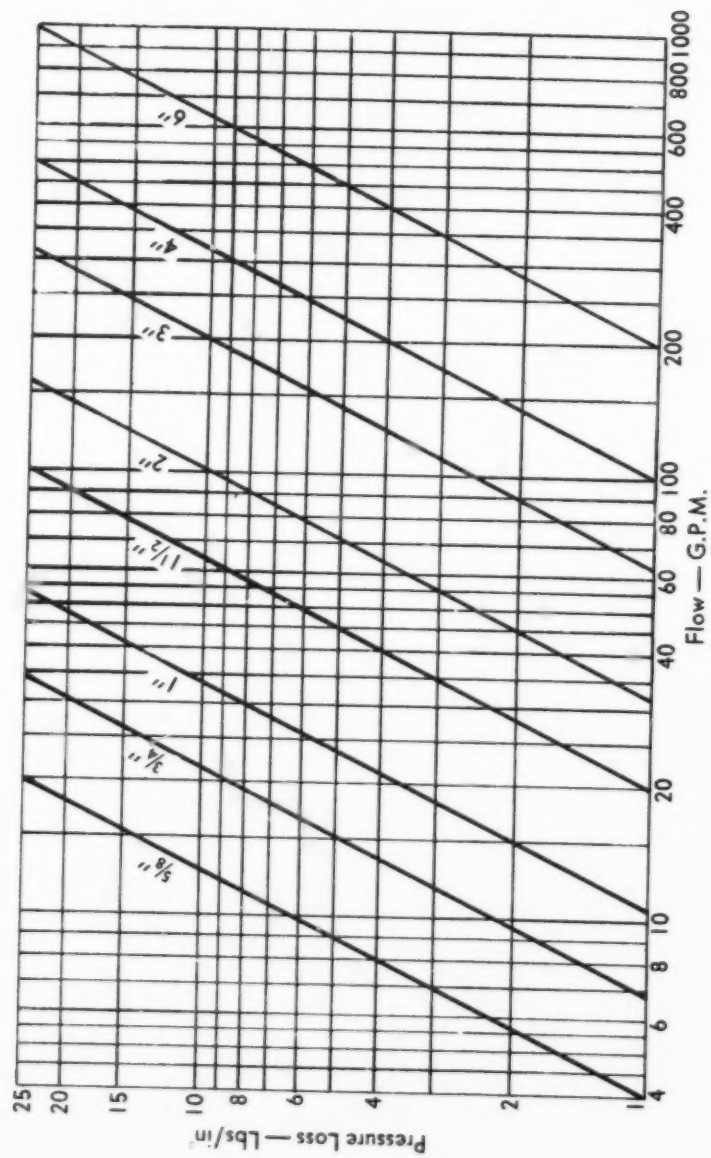


Figure D.3.3.A—Loss of Pressure Through Disk Type Meters in Pounds Per Square Inch (psi)

TABLE D.3.3B.—Allowance in equivalent length of pipe for friction loss in valves and threaded fittings

Diameter of fitting, inches	90° std. ell, feet	45° std. ell, feet	90° side tee, feet	Coupling or straight run of tee, feet	Gate valve, feet	Globe valve, feet	Angle valve, feet
1/8	1	0.6	1.5	0.3	0.2	8	4
1/4	2	1.2	3	0.6	0.4	15	8
3/8	2.5	1.5	4	0.8	0.5	20	12
1/2	3	1.8	5	0.9	0.6	25	15
3/4	4	2.4	6	1.2	0.8	35	18
1	5	3	7	1.5	1.0	45	22
1 1/4	7	4	10	2	1.3	55	28
1 1/2	8	5	12	2.5	1.6	65	34
2	10	6	15	3	2	80	40
2 1/2	12	7	18	3.6	2.4	100	50
3	14	8	21	4.0	2.7	125	55
3 1/2	17	10	25	5	3.3	140	70
4	20	12	30	6	4	165	80

TABLE D.3.3C.—Loss of pressure through taps and tees in pounds per square inch (p.s.i.)

Gallons per minute	Size of tap or tee					
	3/8 in.	1/2 in.	1 in.	1 1/4 in.	1 in.	3 in.
10	1.35	0.64	0.18	0.08		
20	5.38	2.54	0.77	0.31	0.14	
30	12.1	5.72	1.62	0.69	0.33	0.10
40		10.2	3.07	1.23	0.58	0.18
50		15.9	4.49	1.92	0.91	0.28
60			6.46	2.76	1.31	0.40
70			8.79	3.76	1.78	0.55
80			11.5	4.90	2.32	0.72
90			14.5	6.21	2.94	0.91
100			17.94	7.67	3.63	1.12
120			25.8	11.0	5.23	1.61
140			35.2	15.0	7.12	2.29
160				17.2	8.16	2.7
180				19.6	9.30	3.22
200				24.8	11.8	3.62
225				30.7	14.5	4.48
250				38.8	18.4	5.67
275				47.9	22.7	7.00
300					27.4	7.70
					32.6	10.1

TABLE D.3.3D.—Pressure loss of water in pounds per square inch per 100 feet of fairly smooth pipe

Gallons per minute	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"	12"
1.....	0.16												
2.....	0.37	0.17											
3.....	1.2	0.37	0.1										
4.....	2.0	0.61	0.17										
5.....	3.0	0.95	0.25	0.12									
10.....	11	3.5	0.9	0.43	0.13								
15.....	22	7.1	1.8	0.9	0.26	0.11							
20.....	39	13	3.0	1.5	0.45	0.18							
25.....	58	18	4.7	2.3	0.66	0.28	0.10						
30.....		25	6.6	3.2	0.93	0.4	0.13						
35.....		35	8.5	4.3	1.2	0.53	0.18						
40.....		43	11	5.5	1.6	0.63	0.22						
45.....			14	6.7	2.0	0.8	0.3						
50.....			17	8.1	2.4	1.0	0.35	0.1					
60.....				12	3.3	1.3	0.5	0.13					
70.....				15	4.4	1.8	0.63	0.17					
80.....				19	5.7	2.3	0.83	0.23					
90.....				21	7.0	2.9	1.1	0.27					
100.....				23	8.5	3.7	1.3	0.35	0.12				
150.....					17	17.8	2.6	0.7	0.23				
200.....					23	13	4.5	1.2	0.4	0.16			
250.....						18	6.3	1.8	0.59	0.23			
300.....							9.0	2.4	0.8	0.34			
350.....								3.3	1.1	0.45	0.12		
400.....								4.2	1.3	0.59	0.15		
450.....								5.1	1.7	0.7	0.19		
500.....								6.2	2.1	0.85	0.23		
600.....								9.0	2.9	1.2	0.32	0.11	
700.....								13.3	4.9	2.0	0.55	0.14	
800.....									2.5	0.69	0.23		
1,000.....									3.0	0.81	0.28	0.12	
1,500.....									26.5	11.8	0.59	0.24	
2,000.....										13.0	0.98	0.4	
2,500.....										24.5	11.5	0.61	
3,000.....											18.0	0.89	

¹ Velocity at or exceeding 10 fps.

² Velocity exceeds 15 fps.

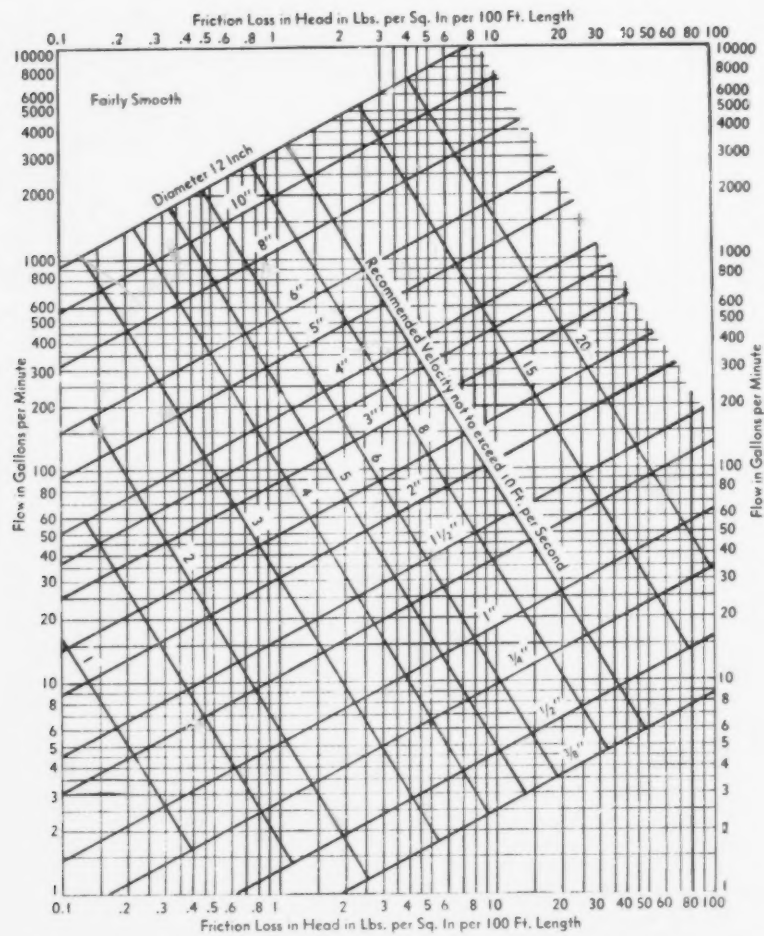


Figure D.3.3.D—Pressure Loss of Water in Pounds Per Square Inch Per 100 Feet of Fairly Smooth Pipe

TABLE D.3.3E.—Pressure loss of water in pounds per square inch per 100 feet of fairly rough pipe

Gallons per minute	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"
1	0.26												
2	0.91	0.22											
3	2.0	0.47	0.17										
4	3.3	0.82	0.30	0.12									
5	5.2	1.3	0.45	0.18									
10	20	4.9	1.7	0.67	0.17								
15	¹ 43	12	3.7	1.4	0.36	0.12							
20	² 80	18	6.2	2.5	0.62	0.20							
25		¹ 29	9.9	3.9	0.97	0.31	0.13						
30		¹ 42	14	5.6	1.3	0.45	0.18						
35		¹ 55	18	7.3	1.8	0.60	0.25						
40		² 70	¹ 24	9.3	2.3	0.75	0.32						
45			¹ 30	12	3.0	0.95	0.42						
50			¹ 37	15	3.7	1.2	0.51	0.12					
60			² 52	¹ 21	5.2	1.7	0.70	0.17					
70				¹ 28	7.0	2.2	0.92	0.22					
80				¹ 37	9.0	2.9	1.3	0.29	0.10				
90				² 45	¹ 12	3.7	1.5	0.36	0.12				
100					¹ 14	4.6	1.8	0.44	0.16				
150					² 30	10	4.2	1.0	0.34	0.13			
200					¹ 17		7.0	1.7	0.59	0.23			
250					² 26	¹ 11		2.6	0.90	0.35			
300						¹ 15		3.6	1.3	0.50	0.12		
350						² 21		4.9	1.7	0.69	0.17		
400								¹ 6.1	2.2	0.88	0.22		
450								¹ 7.6	2.7	1.1	0.27		
500								¹ 9.4	3.3	1.3	0.33	0.11	
600								² 13	¹ 4.9	1.8	0.46	0.15	
700									¹ 6.2	2.5	0.61	0.20	
800									¹ 8.1	3.3	0.80	0.26	0.11
900									¹ 11	¹ 4.1	1.0	0.33	0.13
1,000									² 13	¹ 5.0	1.25	0.40	0.17
1,500										² 12	2.8	0.90	0.37
2,000											¹ 4.7	1.6	0.63
2,500											² 7.2	¹ 2.4	1.0
3,000												¹ 3.4	1.3

¹ Velocity at or exceeding 10 fps.

² Velocity exceeds 15 fps.

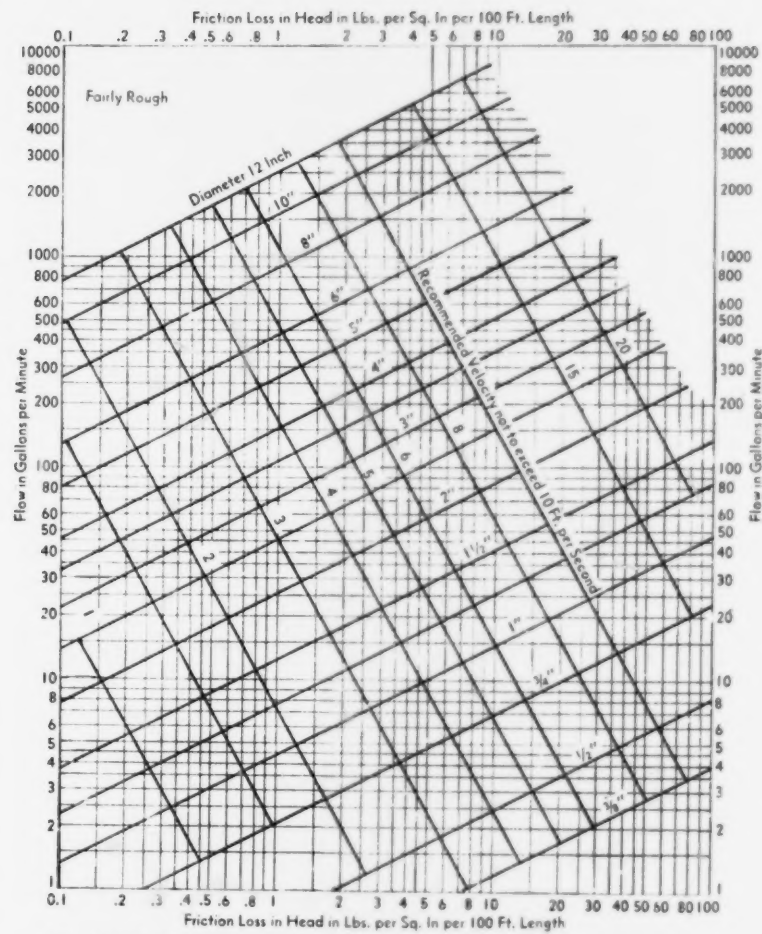


Figure D.3.3.E—Pressure Loss of Water in Pounds Per Square Inch Per 100 Feet of Fairly Rough Pipe

TABLE D.3.3F.—Pressure loss of water in pounds per square inch per 100 feet of rough pipe

Gallons per minute	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"	12"
1	0.31												
2	1.20	0.27											
3	2.7	0.62	0.20										
4	4.7	1.2	0.36	0.15									
5	6.6	1.4	0.46	0.18									
10	30	7.0	2.3	0.94	0.22								
15	167	16.0	6.2	2.1	0.49	0.17							
20		27	9.1	3.7	0.89	0.29	0.12						
25		143	14	5.8	1.3	0.45	0.18						
30		162	21	8.5	2.0	0.63	0.27						
35		185	28	12	2.7	0.90	0.36						
40			137	14	3.5	1.20	0.47	0.12					
45			147	19	4.5	1.45	0.60	0.14					
50			158	23	5.5	1.8	0.74	0.18					
60			183	33	7.9	2.6	1.10	0.25					
70				46	12	3.5	1.40	0.35	0.12				
80				60	14	4.7	1.85	0.45	0.15				
90				76	18	5.9	2.3	0.58	0.19				
100				123	23	7.2	3.0	0.71	0.23				
150				230	17	6.6	1.7	0.53	0.21				
200					129	12	2.9	0.95	0.37				
250					245	118	4.5	1.49	0.58	0.13			
300						126	6.4	2.20	0.80	0.19			
350						236	8.9	2.9	1.20	0.27			
400							12	3.8	1.45	0.35	0.12		
450							15	4.7	1.8	0.44	0.14		
500							18	6.0	2.3	0.55	0.18		
600							25	8.3	3.2	0.78	0.26	0.11	
700								112	4.5	1.20	0.36	0.14	
800								116	6.0	1.4	0.47	0.19	
900								220	7.7	1.8	0.60	0.24	
1,000									19.4	2.3	0.75	0.31	
1,500										5.1	1.7	0.70	
2,000										19.0	3.0	1.25	
2,500											14.7	2.0	
3,000											16.8	2.7	

¹ Velocity at or exceeding 10 fps.

² Velocity exceeds 15 fps.

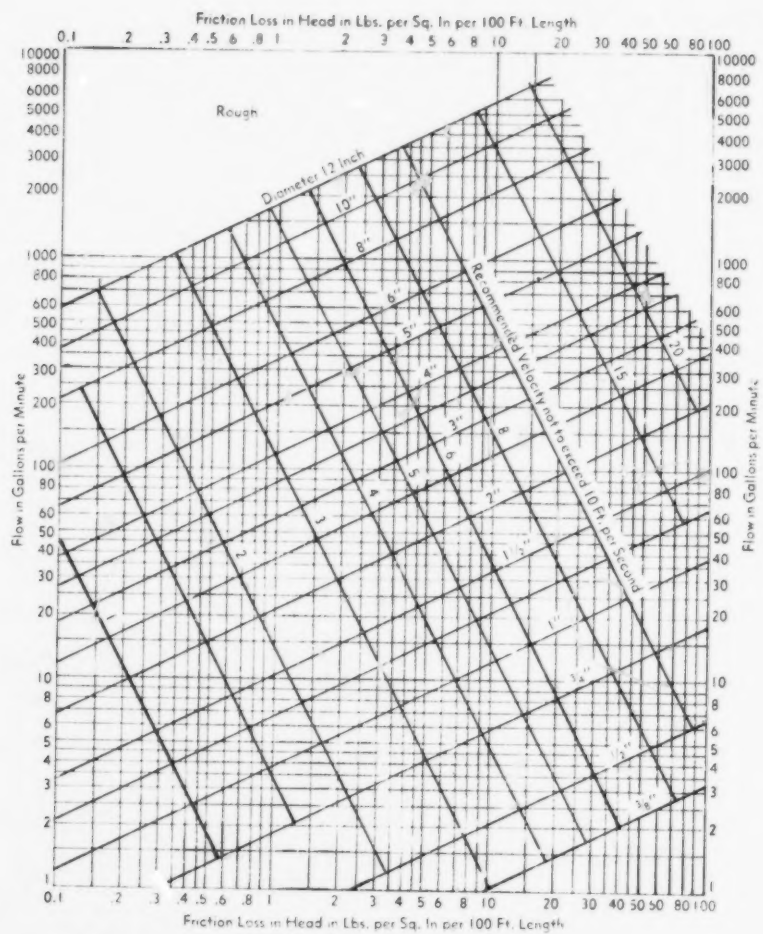


Figure D 3.3.F-Pressure Loss of Water in Pounds Per Square Inch Per 100 Feet of Rough Pipe.

TABLE D.3.3G.—Pressure loss of water in pounds per square inch per 100 feet of rough pipe

Gallons per minute	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"
0.17													
0.21													
0.27													
0.56		0.16											
0.66		0.18											
0.84		0.21											
1.15		0.31											
1.30		0.37											
1.70		0.42	0.13										
1.8		0.51											
2.2		0.61											
2.8		0.69	0.22	0.10									
2.7		0.76											
3.3		0.90											
4.2		1.05	0.34	0.15									
3.8		1.1											
4.5		1.25											
5.7		1.4	0.47	0.21									
5.0		1.4											
6.0		1.7											
7.5		1.8	0.61	0.27									
6.1		1.7											
7.2		2.1											
9.6		2.4	0.68	0.33									
7.6		2.2											
8.9		2.5											
12		2.8	0.93	0.42	0.12								
9.1		2.6											
11.5		3.0											
14.5		3.5	1.2	0.50	0.14								
18.5		5.2											
23		6.1											
28		7.1	2.4	1.10	0.27								
32		8.9											
37		9.9											
45	12		3.8	1.70	0.44	0.16							
46	13												
53	15												
67	17	5.8	2.5	0.68	0.23								
78	18												
91	21												
104	24	8.0	3.5	0.91	0.32	0.13							
124	27												
150	32	11	4.6	1.25	0.42	0.17							
180	38												
210	43												
250	48												
300													
350													
400													
450													
500													
600													
700													
800													
900													
1,000													

¹ For the 3/4" and 1" pipe sizes the three values shown opposite each flow figure are, reading from the top, for Types M, L and K copper tubing respectively.
² Velocity at or exceeding 10 fps.
³ Velocity exceeds 15 fps.

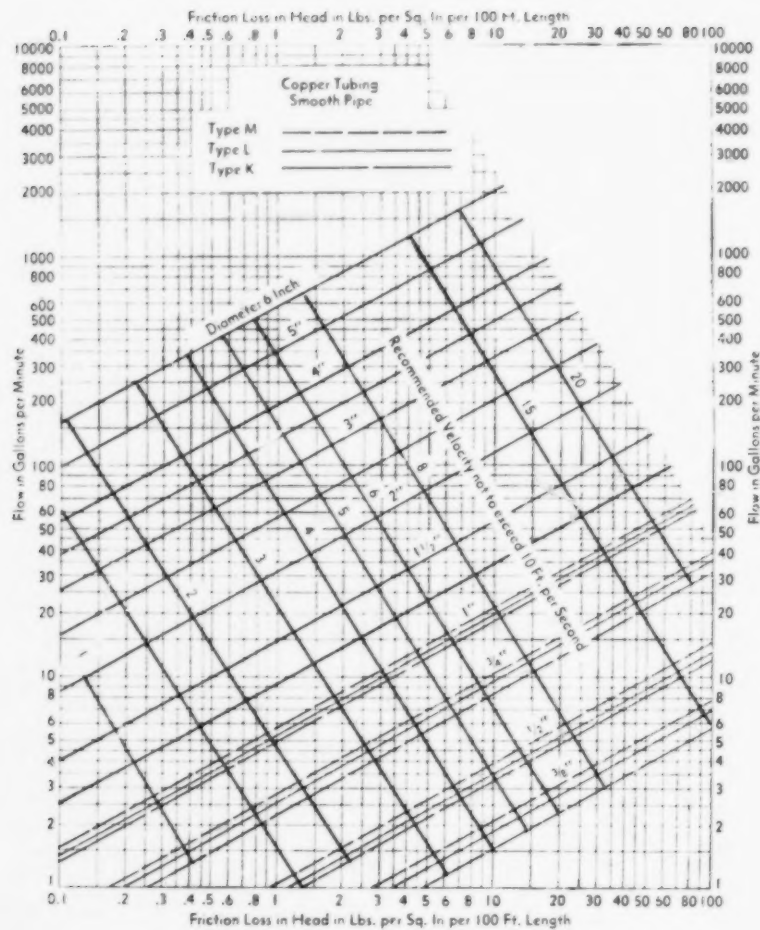
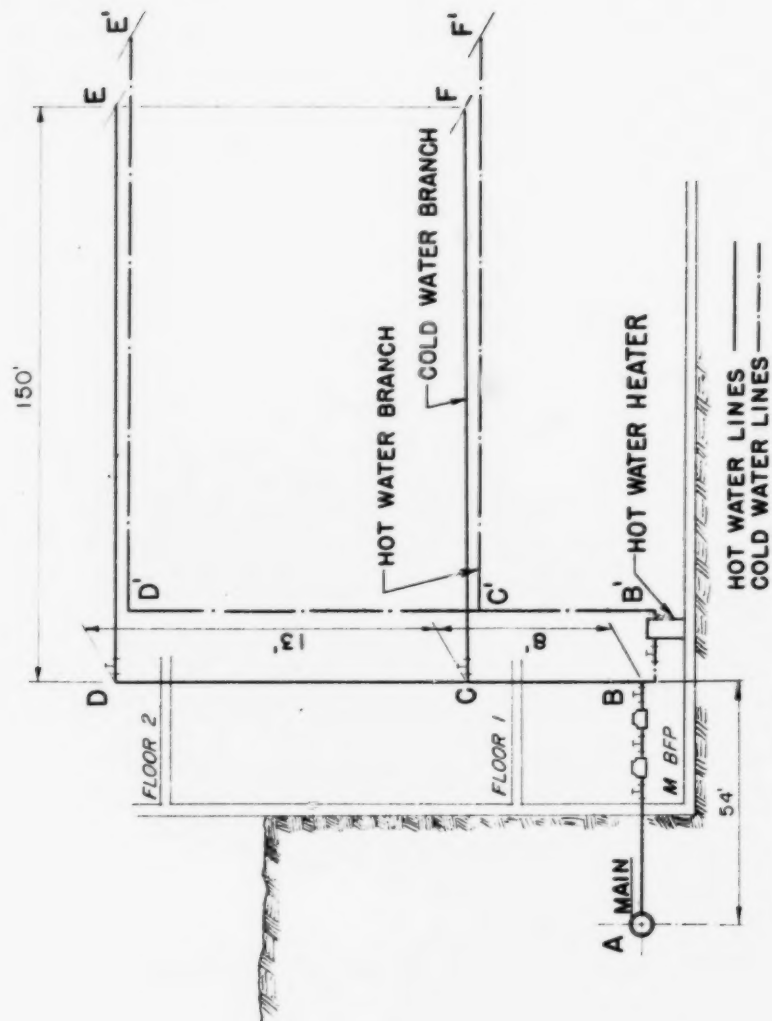


Figure D.3.3.G—Pressure Loss of Water in Pounds Per Square Inch Per 100 Feet of Copper Pipe

- (1) *Example:* What size copper water pipe, service and distribution will be required to serve a two story factory building having on each floor, back to back, two toilet rooms each equipped with four flushometer closets, two flushometer pedestal urinals and four lavatories with hot and cold water? The highest fixture is 21 feet above the street main which is topped with 1½ corporation at which point the minimum pressure is 55 p.s.i. In the building basement a 2-inch meter and 3-inch reduced pressure zone backflow preventer with a maximum pressure drop of 9 p.s.i. are to be installed. The system is shown by the following diagram. To be determined are the pipe sizes for the service main, and the cold and hot water distribution pipes.

A tabular arrangement such as shown below should first be constructed. The steps to be followed in solving the problem are indicated by the table itself as they are in sequence, columns 1 through 8 and lines a through l.



Recommended tabular arrangement for use in solving pipe sizing problems

	Line		Description							Lbs. per square inch-psi
Service and cold water distribution piping	a		Minimum pressure available at main.....							55.00
	b		Highest pressure required at a fixture (Table 1002.7).....							15.00
	c		Meter loss-2" meter (Table D.3.3A).....							11.00
	d		Tap in main-loss 2½" tap (Table D.3.3C).....							1.29
	e		Static head loss 21 x 0.43 psi.....							9.03
	f		Special fixture loss-backflow preventer.....							9.00
	g		Special fixture loss-filter.....							0.00
	h		Special fixture loss-other.....							0.00
	i		Total overall losses and requirements, sum of lines b through h.....							45.32
	j		Pressure available to overcome pipe friction, line a minus sum of lines b to h.....							9.68

1	2	3	4	5	6	7	8	
Pipe section	Gal. per min. through section (determine as in sec. D.3.2)	Length of section (ft.)	Trial pipe size (in.)	Equivalent length of fittings and valves (Table D.3.3B) (ft.)	Total equivalent length col. 5 (100 ft.)	Friction loss per 100' of trial size pipe (Table D.3.3G) (psi)	Friction loss in equivalent length col. 4 x col. 7 (psi)	
AB.....	107	54	2½	12.8	0.67	3.0	2.00	
BC.....	101	8	2½	8	0.16	2.8	0.45	
CD.....	75	150	2½	1.6	1.52	1.7	2.58	
DE.....	28	13	2½	8	0.21	1.7	0.36	
DE.....	28	150	2½	1.6	1.52	1.7	2.58	

k	Total pipe friction losses (cold) 7.97 psi.....							7.97
l	Difference line j minus line k.....							1.71

Hot Water Distribution Piping							
AB'.....	107	54	2½	12.8	0.67	3.0	2.00
B'C'.....	37	8	2	15.3	0.23	1.2	0.22
C'D'.....	28	150	2	1.3	1.51	0.8	1.21
C'D'.....	28	13	1½	5	0.18	3.2	0.56
D'E'.....	28	150	1½	1.0	1.51	3.2	4.84

k	Total pipe friction losses (hot) 8.85 psi.....							8.85
l	Difference line j minus line k.....							0.83

Step 1—*Column 1*—Divide the system into sections breaking at major changes in elevation or where branches lead to fixture groups. After point (B) (see sketch) separate consideration will be given to the hot and cold water piping. Enter the sections to be considered in the service and cold water piping in Column 1 of the Tabular Arrangement.
Column 3—According to the method given in Section D.3.2 determine the GPM of flow to be expected in each section of the system. These flows range from 28 to 107 GPM.

Step 2—*Line a*—Enter the minimum pressure available at the main source of supply. This is 55 p.s.i.

Line b—Determine from Table 1002.7 the highest pressure required for the fixtures on the system. Which is 15 p.s.i. to operate a flushometer valve.

Line c—Select from Table D.3.3A the pressure loss for the meter size given or assumed. The total water flow from the main through the service as determined in step 1 will serve to aid in the meter selected.

Line d—Select from Table D.3.3c and enter the pressure loss for the tap size given or assumed.

Line e—Determine the difference in elevation between the main or source of supply and the highest fixture on the system and multiply this figure, expressed in feet, by 0.43 p.s.i. Enter the resulting p.s.i. product on Line e.

- Line f, g, h*—The pressure losses through filters, backflow preventers or other special fixtures must be obtained from the manufacturer or estimated and entered on these lines.
- Step 4—*Line i*—The sum of (lines b through h) the pressure requirements and losses which affect the overall system is entered on this line.
- Step 5—*Line j*—Subtract line i from line a. This gives the pressure which remains available for overcoming friction losses in the system. This figure is a guide to the pipe size which is chosen for each section as the total friction losses through all the sections should not exceed this value.
- Step 6—*Column 3*—Enter the length of each section.
- Step 7—*Column 4*—Select a trial pipe size. A rule of thumb is that size will become progressively smaller as the system extends farther from the main or source of supply.
- Step 8—*Column 5*—Select from Table D.3.3B the equivalent lengths for the trial pipe size of fittings and valves on the section. Enter the sum for each section in Column 5. (The number of fittings to be used in the installation of this piping must be an engineering estimate.)
- Step 9—*Column 6*—Add the figures from Column 3 and Column 5, and enter in Column 6.
Express the sum in 100's of feet.
- Step 10—*Column 7*—Select from Table D.3.3G the friction loss per 100 feet of pipe for the GPM flow in a section (Column 2) and the trial pipe size (Column 4).
- Step 11—*Column 8*—Multiply the figures in Columns 6 and 7 for each section and enter in Column 8.
- Step 12—*Line k*—Enter the sum of the values in Column 8.
- Step 13—*Line l*—Subtract Line k from Line j.
The result should always be a positive or plus figure. If it is not, it is necessary to repeat the operation utilizing Columns 4, 5, 7 and 8 until a balance or near balance is obtained. If the difference between Lines j and k is positive and large, it is an indication that the pipe sizes are too large and may, therefore, be reduced thus saving materials. In such a case the operations utilizing Columns 4, 5, 7 and 8 should again be repeated.

Answer—The final figures entered in Column 4 become the design pipe size for the respective sections. Repeating this operation a second time using the same sketch but considering the demand for hot water, it is possible to size the hot water distribution piping. This has been worked up as a part of the overall problem in the Tabular Arrangement used for sizing the service and cold water distribution piping. It should be noted that consideration must be given the pressure losses from the street main to the water heater (section AB) in determining the hot water pipe sizes.

APPENDIX E

Suggested Plumbing Ordinance

INTRODUCTION

The material presented in this Code does not have legal standing unless it is adopted by reference, or by inclusion, in an act of state, county, or municipal government. Therefore, administration of the provisions of this Code must be preceded by suitable legislation at the level of government where it is desired to use the Code.

In some places in the Code, reference is made to "Administrative Authority." The identity of an Administrative Authority will be established by the act which gives legal standing to the Code provisions. There follows a recommended form for writing an enabling act or ordinance. Its provisions should be modified to suit local conditions.

E. RECOMMENDED LEGISLATION

E.1 ORDINANCE

An ordinance to provide standards and regulations as set forth in the National Plumbing Code ASA (number to be assigned) for plumbing installed within the _____ of _____ and for the licensing of all plumbers and supervision and inspection of all plumbing within this _____
(State, County, Municipality) (Name)
(State, County, Municipality)

E.2 TITLE AND ADMINISTRATION

This Code shall be popularly known and cited as the Plumbing Code of the _____ of _____. It shall be administered by the _____ which shall take such action as may be reasonable and necessary to secure compliance with it. The _____ shall appoint such assistants, clerks, and other employees as may be required to administer the Code and fix their compensation.
(State, County, Municipality) (Name)
(Name of Administrative Authority)

E.3 SCOPE OF ORDINANCE

The provisions set forth in the ordinance shall be in force and effect from this date _____ within the _____ of _____
(Name) (State, County, Municipality)

E.4 DEFINITIONS

- E.4.1 *Administrative Authority*
Whenever the term Administrative Authority is used in this Code, it shall be construed to mean the _____ or his authorized representative.
(Name of Administrative Authority)
- E.4.2 *Code*
This law, as amended together with any rule or regulation promulgated hereunder by the _____
(Name of Administrative Authority)

E.4.3 Plumber (Master)

A person who has demonstrated his skill in planning, superintending and installing plumbing and who having satisfied the Examining Board as to his knowledge of the rules and regulations governing the same, and as to his business integrity, has been granted a license as a Master Plumber.

E.4.4 Plumber (Journeyman)

Any person other than a master or apprentice plumber who has demonstrated to the Examining Board his practical knowledge of the installation of plumbing and has been licensed by the Board to install plumbing under the direction of a Master Plumber.

E.4.5 Plumber (Apprentice)

A person who: (1) begins his apprenticeship between the ages of 16 and 40; (2) is engaged in learning the plumbing trade by working with and assisting a journeyman or master plumber in the installation, maintenance, and repair of plumbing and drainage; and (3) is covered by an "Apprenticeship Agreement" with a local Joint Apprenticeship Committee.

E.4.6 Plumbing Inspector

Any journeyman or master plumber who is appointed by the _____ to inspect plumbing within the _____ (Name of Administrative Authority) jurisdiction of the Administrative Authority to determine if the plumbing meets the requirements of the Code.

E.4.7 Official Copy

A copy of the National Plumbing Code ASA (number to be assigned) marked with the words "_____ of _____ (State, County, Municipality) _____ (Name) Official Copy," and appropriately amended so as to reflect any differences with the Code, shall be deemed to be an official copy of the Code.

E.5 PLUMBING STANDARDS

E.5.1 Official Copy

Official Copies of the Code to meet the demands, but not less than three, shall be kept on file by the _____, for inspection by and use of the public and may be distributed on demand when available. (Name of Administrative Authority)

E.6 BOARD OF PLUMBING EXAMINERS

E.6.1 Establishment, Composition, Tenure and Compensation

There is hereby established within the _____ (Name of Administrative Authority) a Plumbing Examining Board, hereafter referred to as the Board, to consist of not less than four members as follows: a representative of the _____ (Name of Administrative Authority), a professional engineer, a master plumber, a journeyman plumber, and a lay member of the voting public. Each technical member of the Board shall have at least 5 years' experience in his respective field, and the lay member shall have been a voting resident of the _____ (State, County, Municipality) of _____ (Name) for at least 5 years. The Board members shall be appointed by _____ (Name of Head of Administrative Authority) to serve for a period of 3 consecutive years. Each Board member except if he be a regular employee of the _____ (Name of Administrative Authority), shall be reimbursed for expenses actually incurred and shall be remunerated on a per diem basis for time actually spent in performance of the functions of the Board at a rate which shall be fixed from time to time by the _____ (Name of Administrative Authority).

E.6.2 Meeting of the Board

The Board shall meet not more than 30 days following the adoption of this Ordinance, and after at such times as may be necessary for proper performance of its duties, but at least once during any 6 month period.

E.6.3 Enforcement

The Board is authorized and directed to administer and supervise enforcement of the Code; to provide for such procedures as it may deem necessary to disclose violations; to receive and provide for the investigation of complaints; and to provide for the institution and prosecution of civil or criminal actions or both. To the extent that violation of any provision of the Code creates an imminent danger to health, welfare, or safety, it may be enforced by injunction in any court having jurisdiction to grant injunctive relief.

E.6.4 Hearings

No rule or regulation shall be promulgated until a notice of proposed rule-making which shall contain the entire content of the proposed rule or regulation, shall have been made available for public inspection at the office for the _____, for a period of 3 business days, and if, during that period a public hearing on the proposed rule or regulation is requested by any interested person, it shall be had as soon after the close of the third business day as is practicable, provided that where a proposed rule or regulation is to be applicable to known persons only, in lieu of such posting, a copy thereof shall be sent by regular mail or delivered in person to each such person and, if hearing is waived or not, requested within 2 business days after notice would be received in the ordinary course of mail, no hearing shall be had. Any person who has requested a hearing shall not take any action inconsistent with the proposed rule or regulation pending the final determination after the hearing, which shall be made within 10 days subsequent to the close of the hearing, and if no such hearing shall have been made within that time, the proposed rule or regulation shall be deemed rejected.

E.6.5 Rules and Regulations

The _____ is hereby empowered to promulgate such rules and regulations in accordance with the provisions of the Code as may be required, and any rule or regulation so promulgated shall have the same force and effect as the Code, but no person shall be bound thereby until such rule or regulation has been posted in a conspicuous place at the main office of the _____, for a period of not less than 5 business days except that presentation to any person of a written copy of any rule or regulation shall be in lieu of the above stated posting requirement as to that person.

E.6.6 Granting of Licenses

- a. Plumbers License: No person shall engage in the practice of plumbing either on his own behalf or on the behalf of another either as a master, journeyman, or apprentice plumber without first securing a license from the _____.
- b. Application for License: Any person desiring to secure such license shall make application therefor on forms to be prepared and provided by the Board and before a license is issued, the Board shall determine that the applicant is competent and qualified to practice plumbing on the level of the license for which he is making application and that, to the extent required by the Board, the applicant is familiar with the provisions of the Code. Any conviction for violating the Code or any rule or regulation promulgated thereunder shall be taken into consideration in determining whether or not the applicant is competent and qualified.
- c. Terms of License, Transferability, Fees and Penalties: Every license issued by the _____ shall be for a period ending on the thirty-first day of the December next

following, and shall not be transferable. The fee for each such annual license or renewal thereof shall be \$_____ and shall be paid to the _____ before any license or

(Name of Administrative Authority)

renewal thereof is issued. If a license is not applied for on or before January 1 of each year, or within 30 days after the applicant has practiced as a competent and qualified plumber, a penalty of 10 percent of the license fee shall be imposed for each month thereafter; provided that in no case shall the penalty exceed the amount of the license fee.

d. Offenses: The practice of plumbing on each separate job by an unlicensed person shall constitute a separate offense.

e. Plumbing Business: Every person engaged in the business of plumbing shall employ only licensed plumbers in the practice thereof, except that apprentices, helpers, and laborers may be employed where all of their work is supervised by one or more licensed plumbers.

f. Provisions:

(1) License to take effect: No license shall be required under this Ordinance until the 1st day of January following the effective date of the act.

(2) Reciprocity: The Board may grant a license, without examination, upon payment of the stated fees, to a holder of a substantially equivalent license from another jurisdiction upon satisfying itself that the standards and qualifications required by the other jurisdiction are substantially equivalent to those required by it.

(3) Use of licensee's name by another: No person who has obtained a plumber's license shall allow his name to be used by another person either for the purpose of obtaining permits, or for doing business or work under the license. Every person shall notify the Board of the address of his place of business, if any, and the name under which such business is carried on and shall give immediate notice to the Board of any change in either.

g. Suspension or Revocation: The Board is empowered to suspend or revoke any license issued pursuant to the Ordinance after a hearing upon written notice containing grounds therefor, which notice shall be served personally upon the licensee or his agent at least five days prior to such hearing. At such a hearing the licensee shall be given an opportunity to present testimony, oral or written, and shall have the right of cross-examination. All testimony shall be given under oath. The Board shall have power to administer oaths, issue subpoenas, and compel the attendance of witnesses. The decision of the Board shall be based upon the evidence produced at the hearing and made part of the record thereof. A person whose license has been revoked shall not be permitted to apply for a new license within one year from date of revocation, provided, however, that the person whose license has been revoked may appeal to the courts and if the decision of the Board is reversed, license shall be reinstated. Persons whose license has been revoked and who are applying for a new license shall be re-examined and pay such fees as are prescribed in Section E.6.6c.

h. Re-Examination: Any person who fails to pass an examination prescribed by the Board may apply for re-examination after the expiration of 30 days upon payment of a new fee.

i. Temporary Permit: The Board may issue a temporary license pending examination, provided the applicant holds a similar license from another jurisdiction or other reasons exist therefore which, in the discretion of the Board, merit the issuances of such a permit. Such permit shall not be valid for more than ____ days.

E.6.7 Inspection

Any officer or employee of the _____ may make such inspections of plumbing installations as the _____

(Name of Administrative Authority)

_____ or member of the Board deems necessary or desirable. Inspections shall be at reasonable hours. Their purpose shall be to ascertain whether the Code and the rules and regulations issued

(Name of Administrative Authority)

thereunder are being complied with. They may be regular or special. No person shall obstruct such inspection or fail, upon request, to assist therein.

E.6.8 Permits for Plumbing Works

a. Issuance of Permit: Except as otherwise provided hereunder, no plumbing work in the _____ of _____ shall be undertaken unless there has been issued a permit therefor by the _____. Except as provided in Section E.6.8b, such a permit shall be issued only to a master plumber.

b. Exceptions:

- (1) Single family dwellings: Any permit required by the Ordinance may be issued to a bona fide owner of a single family dwelling, which is to be occupied exclusively for living purposes, to do any work regulated by the Code on the said dwelling and any of its accessory buildings and quarters on the condition that the said owner personally purchase all material and perform all labor in connection therewith.
- (2) Repairs: Repairs which involve only the working parts of a faucet or valve, the clearance of stoppages, the repairing of leaks, or the replacement of defective faucets or valves may be made without permit provided no alterations are made in the existing piping to fixtures.

c. Application for Permit: Application for a permit for plumbing work shall be made on forms prepared and provided by the _____. All applications shall be accompanied by the appropriate fee computed in accordance with the schedule of fees set forth in Section E.6.8d.

d. Schedule of Fees: Fees for permits shall be computed as follows:

	<i>Fee</i>
Each plumbing fixture and waste-discharging device	_____
New or reconstructed sewer connection	_____
Construction or reconstruction of seepage pit	_____
Each septic tank	_____
Each water heater	_____
Each water distribution system or service connection	_____
Repair or alteration of any plumbing system	_____
Any permit requiring inspection, minimum fee	_____

e. Requirements for Plumbing Permits: No permit shall be issued until plans and specifications showing the proposed work in reasonable detail shall have been submitted to the _____. and the Board has determined from examination of such plans and specifications that the proposed work will conform with the provisions of the Code. If a permit is denied, written notice thereof shall be provided to the applicant who may submit such revised plans and specifications as are necessary to obtain approval. If, in the course of the work, it is found necessary to make any change from the plans and specifications on which a permit has been issued, amended plans and specifications shall be submitted and a supplementary permit shall be issued to cover the change after the same conditions required to secure the original permit have been satisfied.

E.6.9 Plumbers Sign

Every holder of a master plumbers license and engaged in the practice of plumbing in the _____ of _____ shall display in a conspicuous place at the entrance to his place of business a sign bearing his name and the words, "Licensed Master Plumber" in letters not less than three inches high.

E.6.10 Master Plumber's Bond

A person who has been issued a master plumber's license shall execute and deposit with the ----- a bond in
(Name of Administrative Authority)
the amount of \$----- which shall be so conditioned that all plumbing work performed by the licensee or under his supervision shall be performed in accordance with the provisions of the Code and that he will pay all fines and penalties properly imposed upon him for violation of the provisions of the Code. A master plumber's license shall not be valid unless a bond has been executed and deposited as herein provided.

E.6.11 Protection of Water Supply System

The Board shall make such rules and regulations in furtherance of the purposes of the Code and not inconsistent with the specific provisions of the Code, for the installation, repair, or alteration of air-conditioning systems, water treatment equipment, and such other water operated devices as it may deem necessary to properly protect the water supply system.

E.6.12 Violations and Penalties

Any person, whether individually or as a member or employee of a partnership, or an officer, agent, or employee of a corporation, who directs or knowingly permits any violation of any of the provisions of the sections of the Code, or any rule or regulation duly promulgated thereunder or who aids or assists therein, either on his own behalf or in the interests of his employer or principal shall, upon conviction thereof by a court of competent jurisdiction be guilty of a misdemeanor punishable by a fine of not more than \$100 or to imprisonment in the ----- for not more than 30 days, or both for each separate violation. Each failure to comply with a mandate or prohibition of the Code shall be deemed a separate offense.

E.6.13 Condemned Equipment

The Administrative Authority shall condemn any used plumbing material or equipment which is so worn, damaged, defective, or constructed as to constitute a sanitary or safety hazard and such condemned material or equipment shall not be reused for plumbing purposes. Where in the opinion of the Administrative Authority condemned material or equipment should be destroyed to prevent its reuse, he may order such destruction.

E.7 OPERATION AND EFFECT

The provisions of the Code are supplemental to all other laws relating to plumbing which are not referred to herein and shall not be construed to modify, repeal, or in any way affect any provision of any other laws not expressly repealed herein.

E.8 SEPARABILITY

If any clauses, sentences, paragraphs, or other parts of the Code, or the application thereof to any person or circumstances, shall, for any reason, be adjudged by a court of competent jurisdiction to be invalid, such judgment shall not affect, impair or invalidate, the remainder of the Code, and the application thereof to other persons or circumstances, but shall be confined in its operation to the clause, sentence, paragraph, or part thereof directly involved in the controversy in which the judgment shall have been rendered and to the person or circumstances involved. It is hereby declared to be the legislative intent that the Code would have been adopted had such invalid provisions not been included.

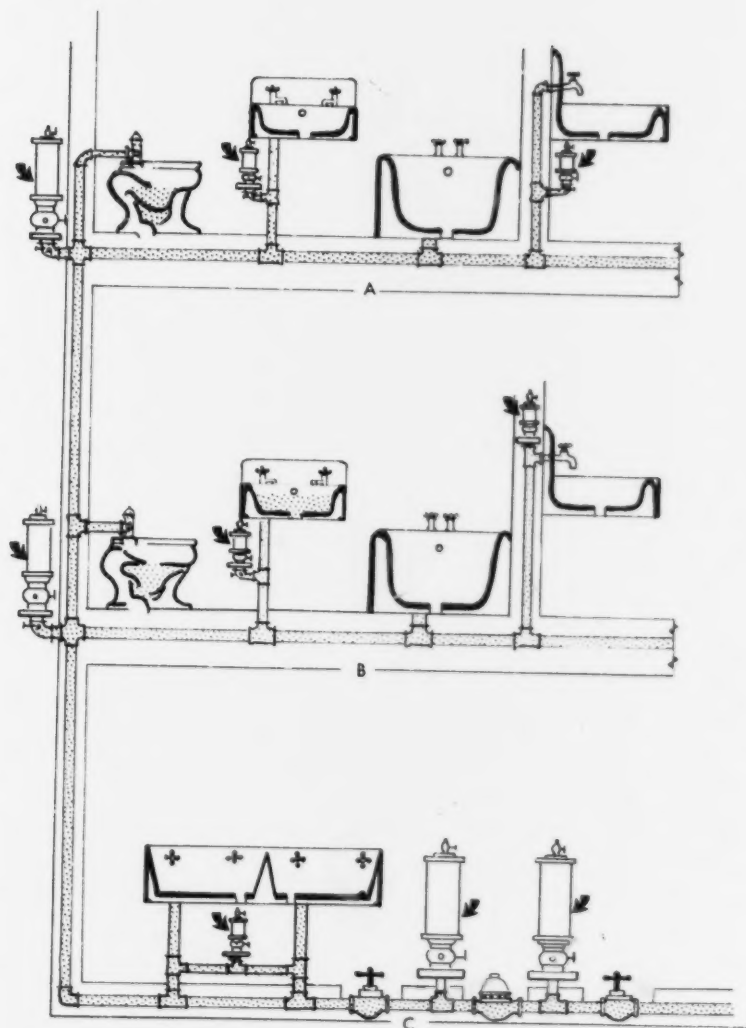


Figure 1 (Sec. 1002.3) - Illustrating Typical Location Points For Water Hammers And Arresters. (Air Chambers and Shock Absorbers).

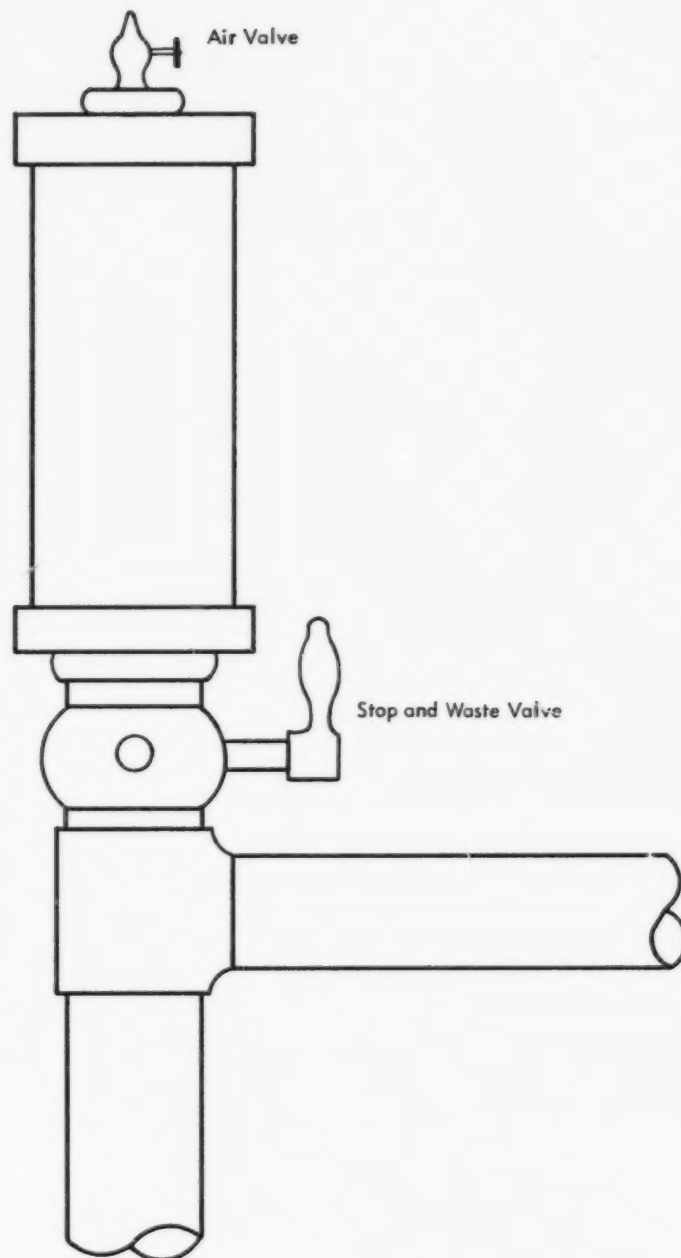


Figure 2 (Sec. 1002.3a) - Typical Air Chamber To Control Water Hammer.



Figure 3 (Sec. 1004.2.2)



Figure 4 (Sec. 1004.2.2)

A - Air Gap

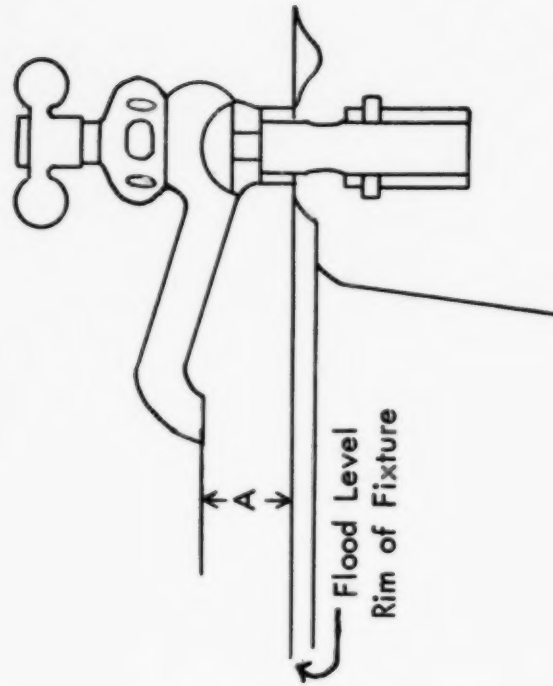


Figure 5 (Sec. 1004.11.2a) - Air Gap And Effective Opening.

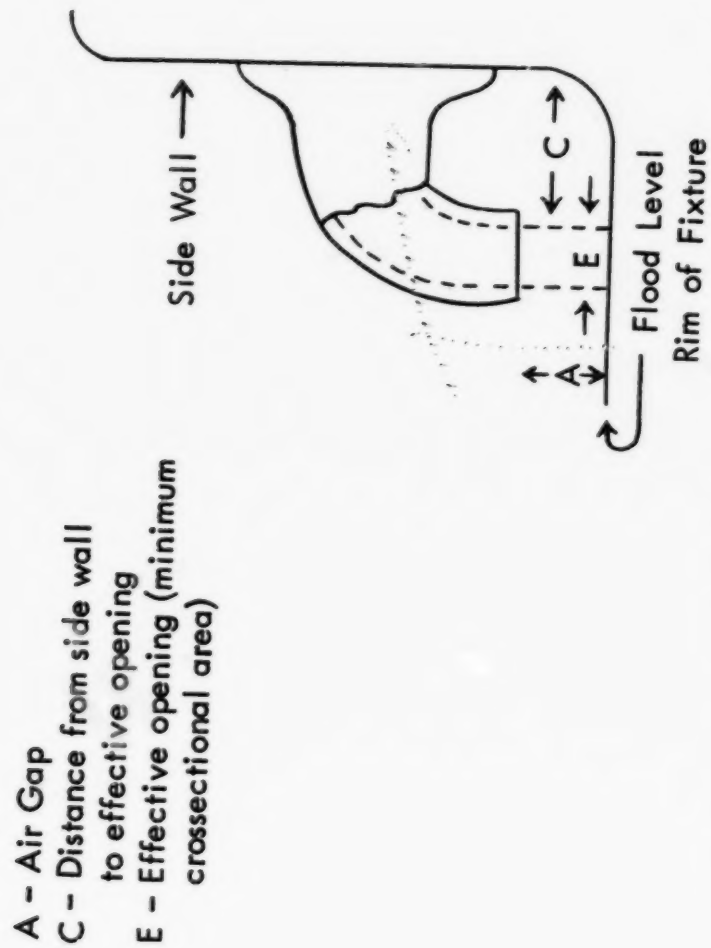


Figure 6 (Sec. 1004.11.2) - Near Wall Influence On Air Gap.

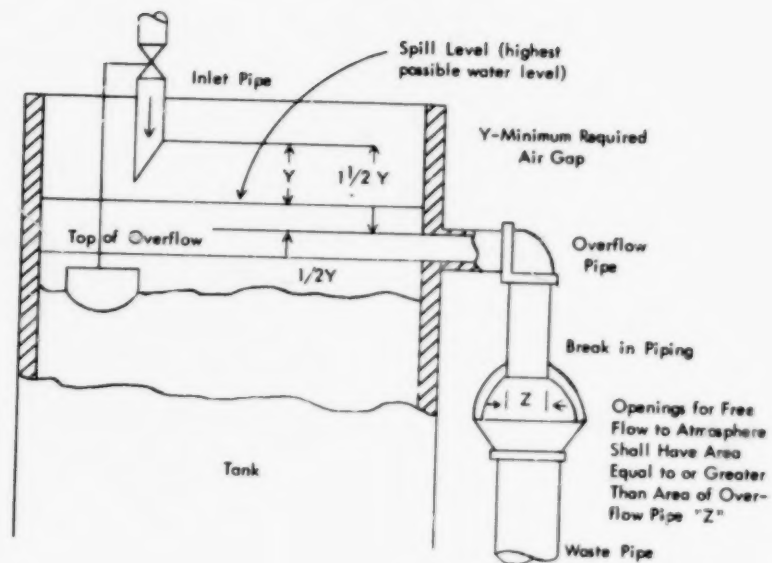


Figure 7 (Sec. 1004, 11.6) - Air Gap in Open Tank With Overflow.

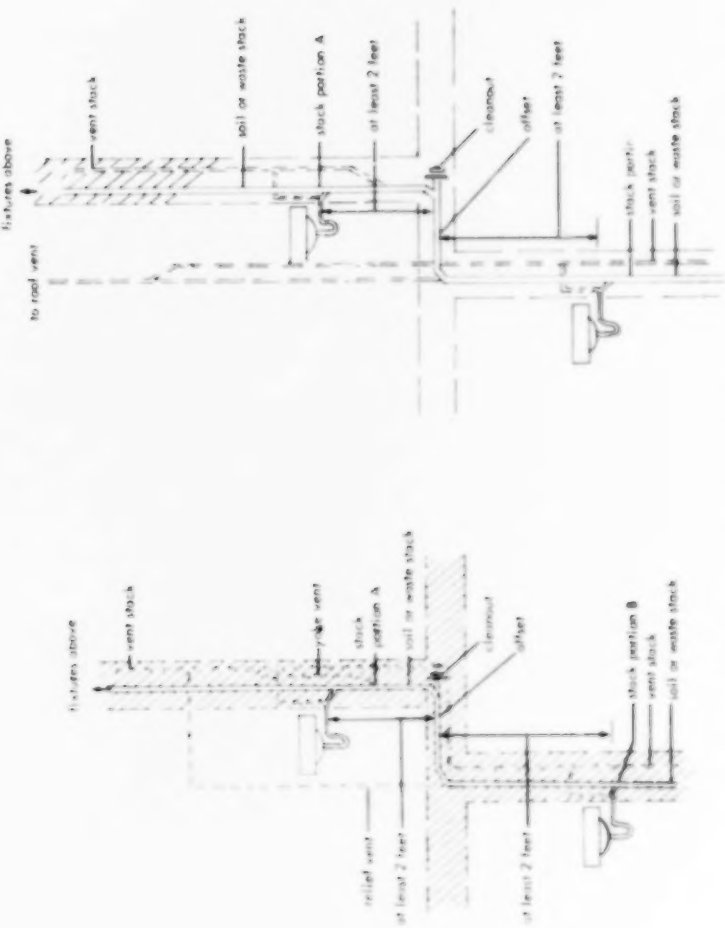


Figure 8 (Sec. 1202, B) - Offsets in Buildings Five Or More Stories.

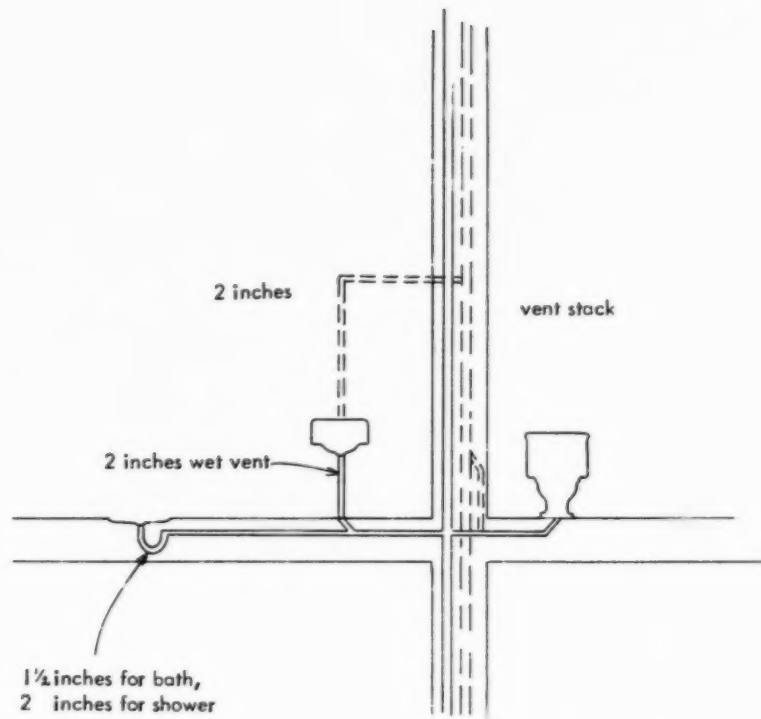


Figure 10 (Sec. 1205.3) - Exception to wet venting multistory bathroom groups.

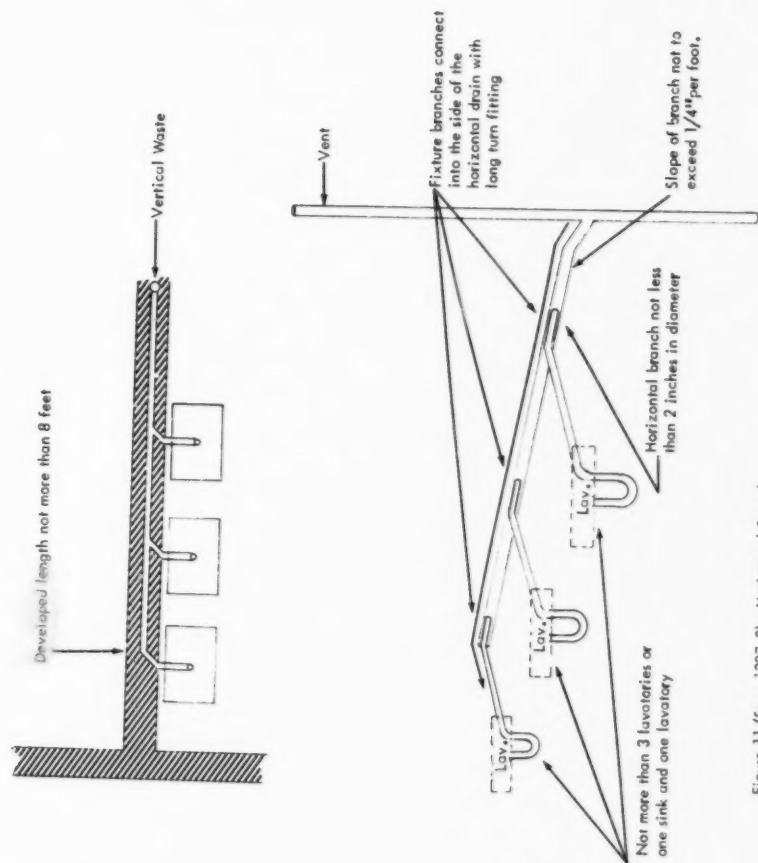


Figure 11 (Sec. 1207.2) - Horizontal Branches

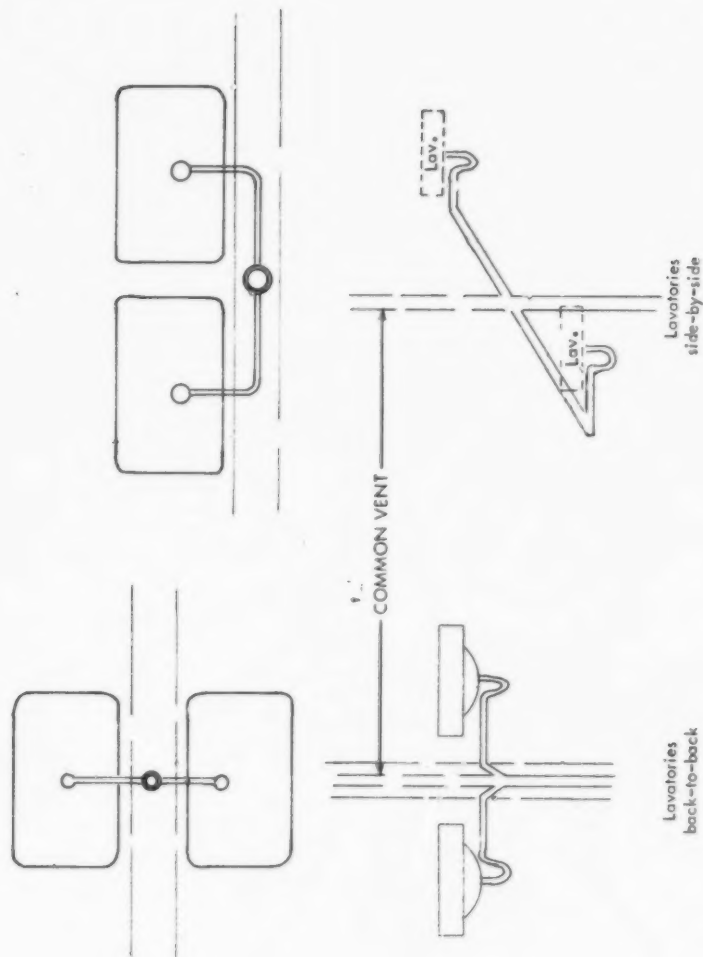


Figure 12 (Sec. 1208.1) - Individual vent at common vent.

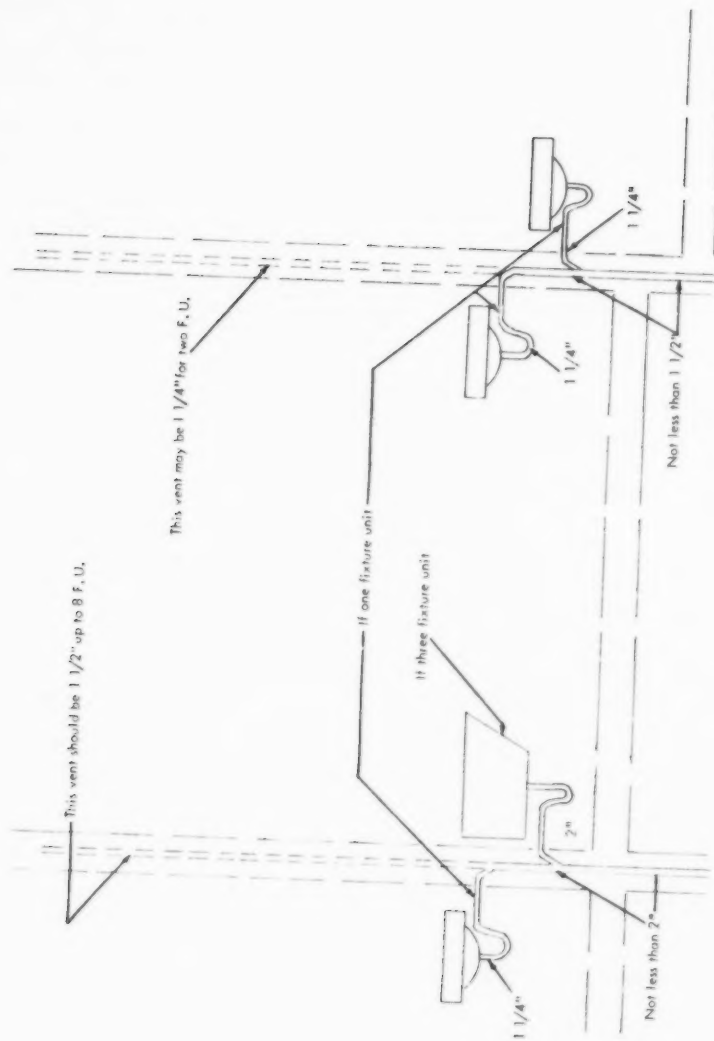


Figure 13 (Sec. 1208.2) - Fixtures connected to stack at different levels.

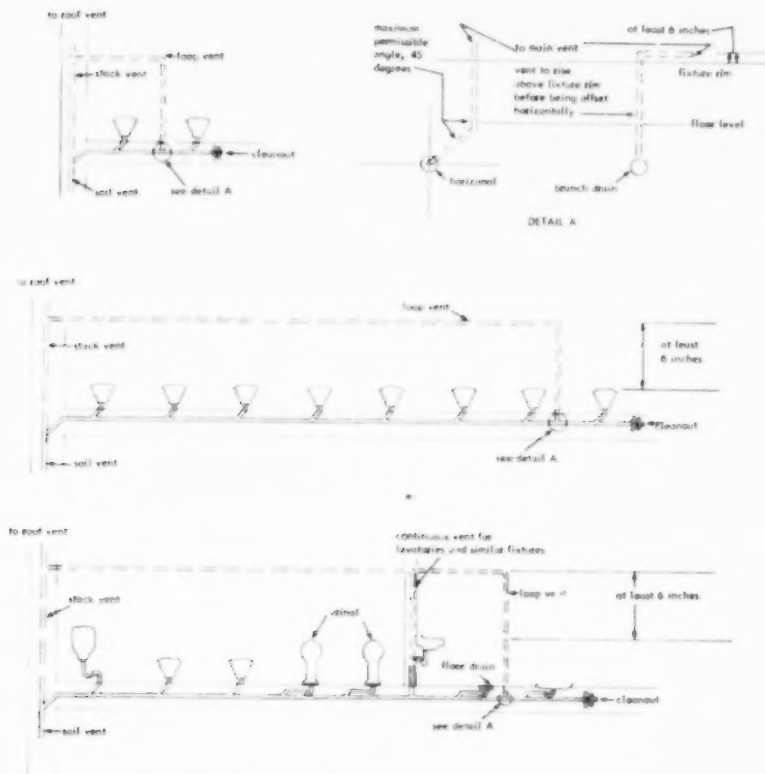


Figure 14 (Sec. 1209.11) Battery venting.

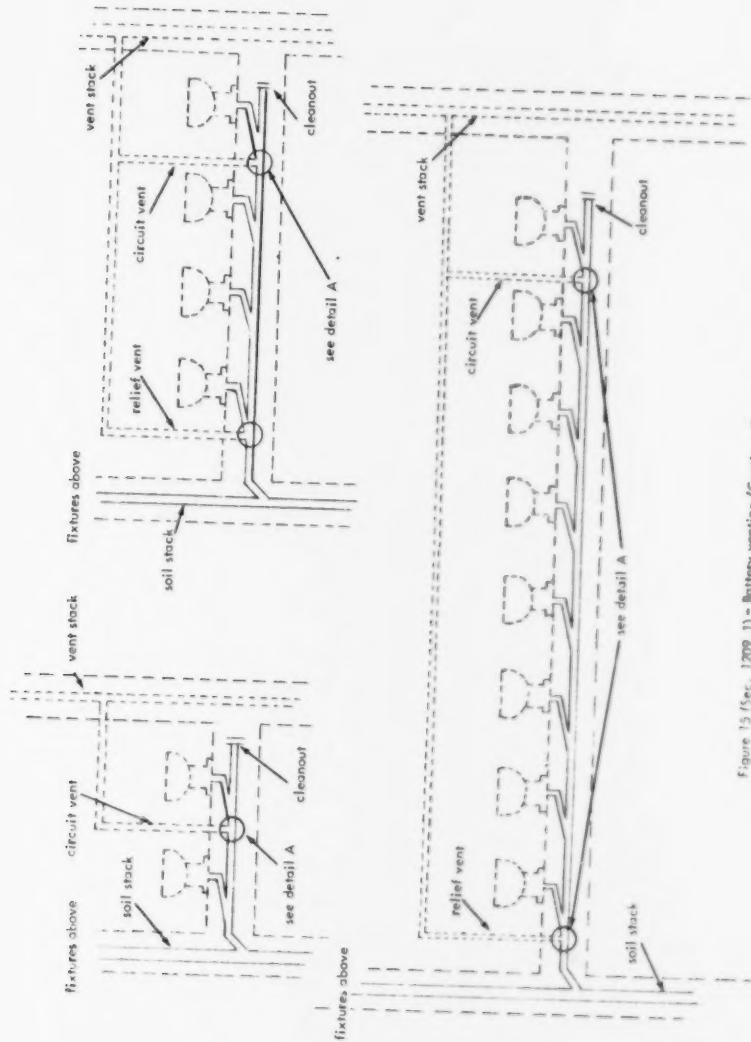
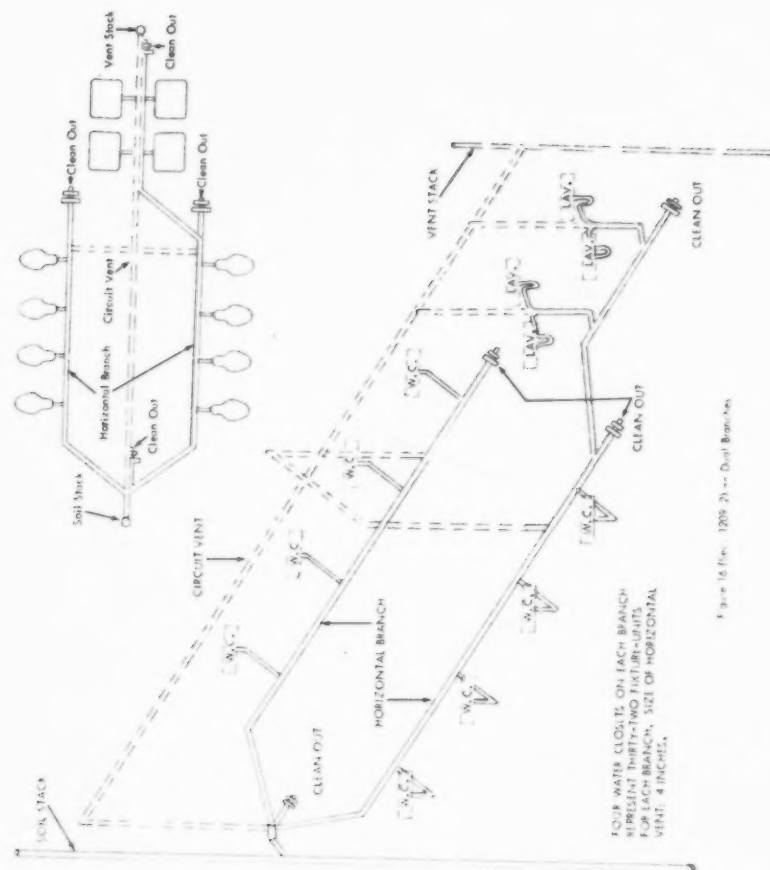


Figure 13 (Sec. 1209.1) - Battery venting (Continued)



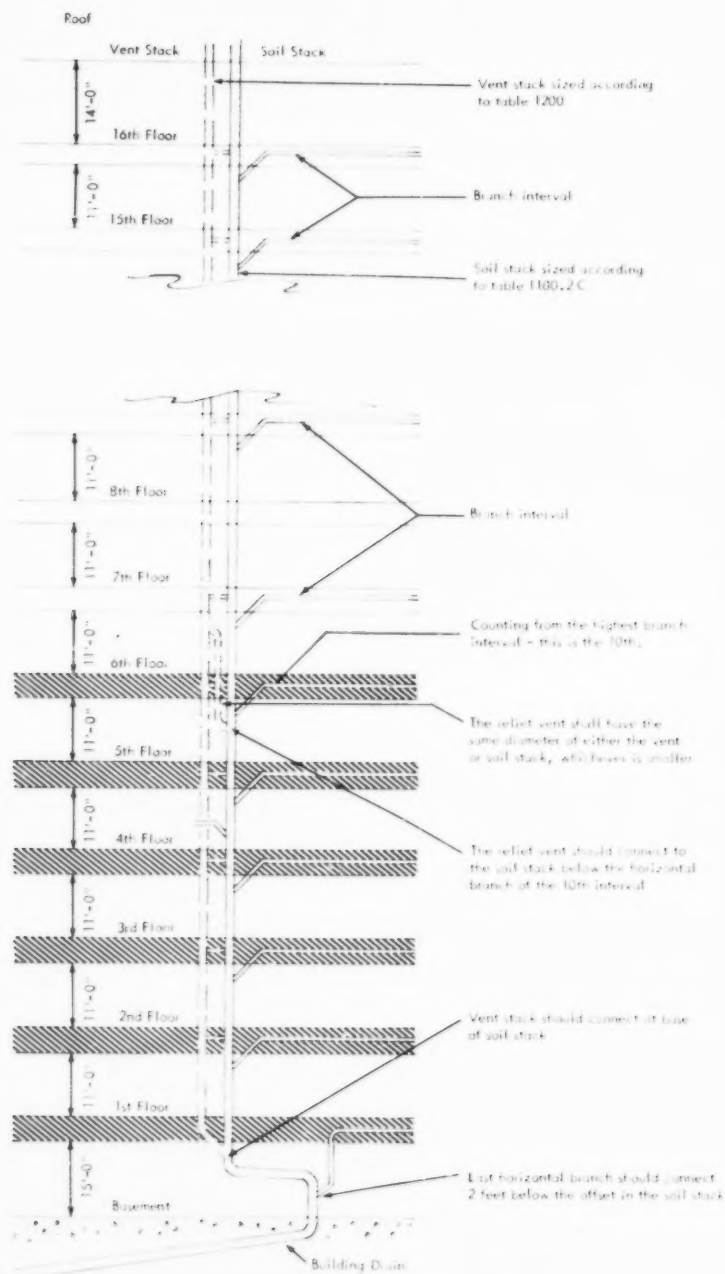
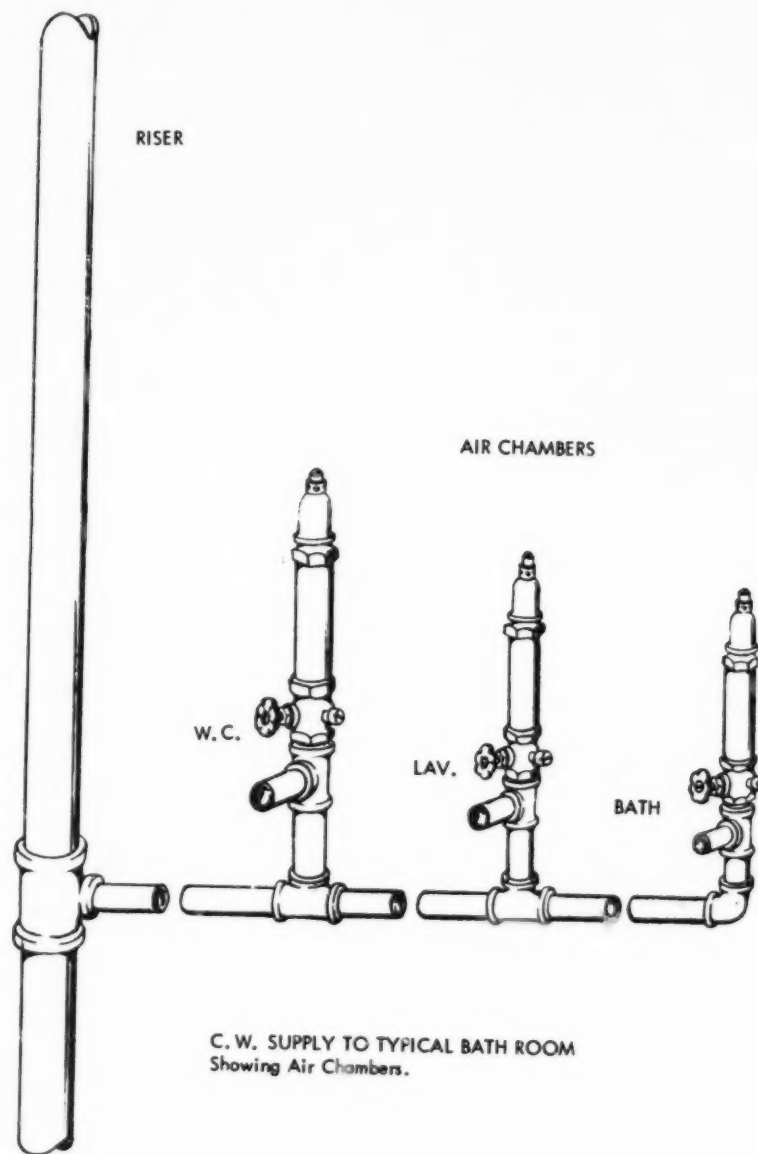


Figure 17 (Sec. 1213) - Relief vents for stack of more than ten branch intervals.





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